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NOVEMBER 1937

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UNITED STATES DEPARTMENT OF AGRICULTURE

WEATHER BUREAU

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CORRECTION

See correction in River and Flood section on page 400.

MONTHLY WEATHER REVIEW

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VOL. 65, No. 11
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NOVEMBER 1937

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ADVANCES IN INTERNATIONAL METEOROLOGY IN 1936 AND 1937 [1]

By WILLIS RAY GREGG

[Weather Bureau, Washington, December 1937]

INTRODUCTION

The two years 1936 and 1937 undoubtedly constitute a period of greater activity and more far-reaching significance in international meteorology than any other similar period or even considerably longer period in the entire history of meteorological service. A mere recital of the events that have occurred is impressive. First, there was the Lusaka conference of Regional Commission I (Africa) in August 1936, followed by a similar conference of Regional Commission II (Far East) at Hong Kong in January 1937. A highly important conference of the newly formed Commission on Aeronautical Meteorology was held in Paris during June 1937. September was marked by conferences of Regional Commission III (South America) at Lima, Peru, and of the International Meteorological Committee at Salzburg, Austria, the latter being preceded by meetings of Commissions on Agricultural Meteorology, Climatology, Synoptic Weather and Projections for Meteorological Charts, and of two Sub-Commissions on Medical Meteorology and on Sea Swells. Finally, during the present month, December 1937, a conference of directors of meteorological services in the Southwest Pacific has been held at Wellington, New Zealand.

REGIONAL COMMISSIONS

It is of interest to note that all of these conferences, with the exception of most of those at Salzburg, were the direct result of action taken by the international Meteorological Organization at Warsaw in 1935. At that conference representatives of services in tropical countries pointed out that they have special problems, differing from those in temperate latitudes, the solution of which, bringing them into harmony with international standards and practice so far as possible, could be best achieved by holding regional conferences. The proposal was approved and Regional Commissions I and II, the membership to consist chiefly of directors of meteorological services, were authorized for Africa and the Far East. Later, South America was established as Regional Commission III. The adoption of this rather fundamental change in policy on the part of the International Meteorological Organization has been abundantly justified by the accomplishments of the conferences held during the past year and a half. So convincing were these results that action was taken at Salzburg to establish a fourth Regional Commission for North and Central America. This new policy is not to be interpreted as, in any sense, a breaking down of internationalism in meteorological service, but rather as a recognition that different regions have problems of their own which must be locally studied and solved and, to the greatest possible extent, woven into the international system.

Another action taken at Warsaw in 1935 along this same general line was the designation of regional sub-commissions of the Synoptic Weather Commission, one, for example, for North America, one for South America, one for the Southwest Pacific, and others. That for the Southwest Pacific has, as previously stated, held a conference during the present month at Wellington.

COMMISSION ON AERONAUTICAL METEOROLOGY

Finally, action of far-reaching significance at the Warsaw conference was the appointment of a new Commission on Aeronautical Meteorology which met for the first time at Paris in June 1937. The circumstances leading up to the organization of this commission are set forth in the MONTHLY WEATHER REVIEW, December 1935.

IMPORTANT ACTIONS TAKEN BY INTERNATIONAL METEOROLOGICAL COMMITTEE AT SALZBURG

It would be tedious to attempt to give a detailed account of the proceedings of all of these conferences. For that matter those at Wellington are of course not yet available; and the resolutions passed at Lima with the exception of a few of the most important that were transmitted by cable, were not received at Salzburg in time for consideration. It is my purpose, therefore, to call attention to resolutions adopted by the International Meteorological Committee at Salzburg which appear to be of greatest significance in indicating definite advances in the international aspects of meteorological service. These resolutions are in large part based on action taken by the various commissions and subcommissions.

RADIOMETEOROGRAPHS

During recent years many meteorological services have given special attention to the development of the radiometeorograph, or, as it is frequently called, the "radiosonde." At Salzburg it was felt that this development had proceeded to a point fully justifying the immediate adoption and use of this method of upper air exploration, and perhaps no more important action was taken by the Committee than the passing of a resolution on this subject, following prolonged discussion as to recent progress. The resolution is as follows:

The development of the radio-sonde has placed at the service of synoptic meteorology a new and powerful instrument for the exploration of the upper atmosphere in all conditions of weather.

[1] Presented at the meeting of the American Meteorological Society, Indianapolis, Ind., December 28, 1937.

Full use of the observations which the instrument provides requires the cooperation of all meteorological services to establish a network of such stations. Only by the provision of a network of stations can the construction of the necessary upper air and particularly stratospheric charts be prepared.

The Committee considers that a network of about 50 stations is necessary for Europe and a corresponding density is desirable for other parts of the temperate zones. A network of stations is equally necessary in the Tropics and polar regions.

The Committee recognizes that the maintenance of these stations and the provision of the personnel required to operate them will involve considerable expense; but it is convinced that further substantial advance in forecasting, and the solution of the problems arising from the extension of flying to great distances and heights, depends on the establishment of an organized system of radio-sonde observations.

The formal resolution was followed by a suggested apportionment of stations among European countries and other regions of the world. Since 50 are recommended for Europe and "a corresponding density for other parts of the temperate zones," the number for North America would amount to something like 125. It was encouraging to note that the representatives of all countries accepted their quotas with enthusiasm and indicated a determination to make every possible effort to carry out their part of the program.

AERONAUTICAL METEOROLOGY

Prior to the Warsaw conference of 1935 there existed much confusion regarding the international development of aeronautical meteorology owing to the lack of coordination in the consideration of the subject by three independent organizations, viz, the Commission on the Application of Meteorology to Aerial Navigation (this being a Commission of the International Meteorological Organization), the International Commission for Air Navigation (C. I. N. A.), and the International Aeronautical Conference (C. A. I.), the last two of which had subcommissions dealing with weather service (see MONTHLY WEATHER REVIEW, December 1935). The new Commission on Aeronautical Meteorology, with Dr. R. Bureau of the French Meteorological Service as president, was created by the I. M. O. at its Warsaw conference for the purpose of coordinating the efforts of these various organizations, and its success in bringing about such coordination can properly be put down as the most important accomplishment of the Paris conference.

The Commission adopted many resolutions, later confirmed by the International Meteorological Committee at Salzburg, among which the following are of special interest and significance:

Meteorological protection for flights on international routes should be provided, in all cases, by official—i. e., Governmental—services in all countries concerned and in accordance with universal rules prepared by the Commission on Aeronautical Meteorology (C. I. M. Aé.). This applies particularly at the present time to the organization of service for transoceanic flying, and a subcommission was appointed to deal with that subject.

The adoption by all countries of the international code was urged as a fundamental necessity for efficient collection and dissemination of synoptic reports.

All countries are requested to keep the Commission informed of new methods and techniques that they consider useful for the development of international aeronautical meteorology. This includes pamphlets giving instructions, such for example as Circular N of the Weather Bureau.

Synoptic reports should be made at intervals of 3 hours on continents and inland seas and at intervals of 6 hours on the oceans.

The formulation of a uniform code for transmission of forecasts is recommended and will be undertaken.

The great importance of upper air soundings on ships as well as at land stations and reaching into the stratosphere is emphasized.

In view of the lack of ships' reports from certain critical areas in the oceans, recommendation was made that stationary meteorological ships be provided in order to fill these gaps, such ships to take both surface and upper air observations and to be equipped with adequate radio apparatus to enable them to function as collecting and transmitting centers. Already a beginning along this line has been made by the French and German Governments. The great need of more frequent and complete data from ships that are now reporting also was stressed.

Many other resolutions dealing with methods of observation, codes, symbols, meteorological training of pilots and other details were passed, and these will soon be available in published form.

AGRICULTURAL METEOROLOGY

An important action of the Commission on Agricultural Meteorology was the appointment of a subcommission for the study of hail, including cooperation with the International Committee on Hail Insurance.

Of special interest to American meteorologists was the appointment of J. B. Kincer, of the Weather Bureau, as president of a subcommission to cooperate with the International Institute of Agriculture at Rome in preparing world maps of precipitation and other meteorological elements for use with similar maps of soils of the world.

CLIMATOLOGY

Among the nine resolutions passed by the Climatological Commission those of chief importance relate to arrangements for intercontinental comparison of standard barometers and to the adoption of Dr. Tor Bergeron's classification and description of hydrometeors. With regard to the latter the committee, in accepting it, specified that appropriate footnotes should be included in the English text, in the case of those terms, such as mist, drizzle, and particularly sleet, the meanings of which are not the same in America and Great Britain.

PROJECTIONS AND SCALES FOR METEOROLOGICAL CHARTS

The resolutions adopted at the Salzburg meeting by the Commission on Projections for Meteorological Charts and by the International Meteorological Committee, relative to projections and scales for meteorological charts, will be discussed in detail in the December MONTHLY WEATHER REVIEW.

SYNOPTIC WEATHER

Over 60 resolutions were passed by the Commission for Synoptic Weather Information and these were later either adopted or approved by the committee. A large number dealt with modifications of resolutions concerning codes, symbols, etc., that had been adopted at previous conferences. Perhaps the most important new one was that regarding the organization of networks of radio-

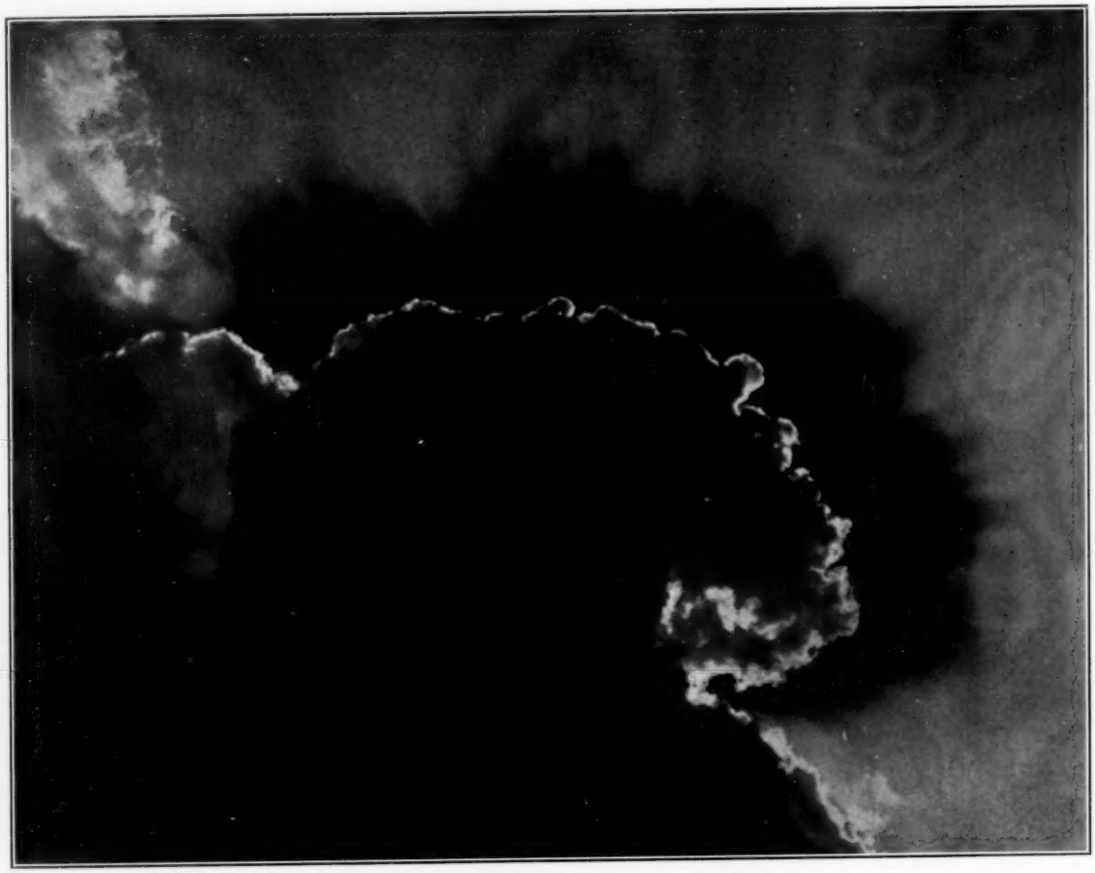

FIGURE 1.

meteorograph stations, already referred to. Others included the reduction of pressure to levels of 1,000, 1,500, and 2,000 geodynamic meters; provision for "signs of tropical cyclone" in the ww code (No. 92), this being assigned to ww 19 (other significant changes in this code were: ww 17=visibility reduced by smoke; e. g., veldt or forest fires, or industrial smoke or volcanic ashes; and ww 18=duststorm—visibility greater than 1 km); adoption of a new code for mean pressure over the oceans; recommendation that green and brown colors be used respectively for shading to indicate precipitation, and sand or dust storms on synoptic charts; adoption of a special code for use at stations near the Poles to indicate wind direction; adoption of a new code for international exchange of upper-air wind data; inclusion of mountain station reports in collective messages.

MISCELLANEOUS

A subcommission on sea swells of the Commission on Maritime Meteorology decided to institute an international week of observations of swells in the North Atlantic in 1938, with the hope of extending it in later years to all the oceans. Plans for organizing the program for 1938 are now being worked out.

One of the most important resolutions at Lima was the decision to broadcast twice daily from Rio de Janeiro synoptic reports from 84 South American stations. This new service is to begin January 1, 1938.

1941 CONFERENCE IN AMERICA

Of special interest to all American meteorologists is the decision of the International Meteorological Committee to hold the next general conference on this side of the Atlantic in 1941. This action was taken in response to an invitation issued jointly by the Director of the Canadian Meteorological Service and the Chief of the U. S. Weather Bureau. The plan is that several of the Commissions will meet in Toronto, and these meetings will be followed by the regular six-yearly conference in Washington. This will be the first meeting of this international body in America, and plans already are being worked out to make it one of the most successful ever held anywhere.

CONCLUSION

The onward march of international meteorology is marked by several outstanding accomplishments, among them the preparation and adoption of an International Cloud Atlas, the organization of the Polar Year campaign of 1882–83, and another 50 years later; the establishment of a program of simultaneous upper-air soundings on "International Days;" and the decision to utilize radio in exchanges of reports between continents. Undoubtedly one of the most fruitful of all conferences was that at Copenhagen in 1929, when action of far-reaching significance was taken in standardizing codes and symbols and many other features of international service. The Warsaw conference was notable in putting the finishing touches on much of the fine work so well begun at Copenhagen. But it seems quite certain that the period of a year and a half now coming to a close will take its place as second to none in advancing the high ideals of internationalism in meteorological service, marking as it does a more completely world-wide interest and activity than has any other in the entire history of the International Meteorological Organization.

A CURIOUS PHOTOGRAPHIC CLOUD EFFECT

By W. J. HUMPHREYS

[Weather Bureau, Washington, December 1937]

The correct interpretation of a photograph of a meteorological phenomenon is not always obvious. In many cases this difficulty is owing to unsuspected effects caused by the photographic equipment used, or by the process of development and printing, or both. An excellent example of this sort of puzzling photograph is that of "dark lightning," so called because the positive print shows the streaks as dark lines, and not white as one would expect them to be. This phenomenon does not appear on all pictures of lightning, and when it does occur is more pronounced along the branch discharges than on the main trunk. Of course, despite the testimony of the photographs, the streaks on them are not dark because the lightning itself was black, but for some other reason; and that reason, called the Clayden effect, is a photographic reversal induced by an exceedingly brief, bright image followed by a diffuse fogging illumination. The first light shock renders the plate relatively insensitive at the place or places struck, while the subsequent light darkens the rest of the plate; hence the unexpected reversal in the print. So much for a review of "dark lightning."

The accompanying picture is a fine example of another such puzzle, one which from its analogy to "dark lightning" might be called "black sky." Its explanation is this: Considerably below the level of the cumulus head there was a thin horizontal sheet of sparse cloud, or dust loaded with more or less condensation; and below that in turn, a much fainter haze, due to dry dust, extending down probably to the ground. Above the thin cloud, or sheet of dense haze, the atmosphere was comparatively free from any particles of light-reflecting size. Under these circumstances the sky seen through the portion of the cloud veil that is shaded by the cumulus above would be, and on this occasion was, a clear deep blue, and the sky outside the shaded area a gray blue. If, then, this combination of sky and cloud were photographed with an equipment that would eliminate the blue and violet while registering the rest of the light, the cumulus would print dark with a white fringe, and the sky black near the cumulus where it "looks" clear blue, and a slightly streaked gray beyond. Just such was the equipment in this case; an Eastman K_2 filter that cuts out the blue and violet while leaving the other colors, and a panchromatic film; exposure $\frac{1}{250}$ second, F/11.

This picture, taken at Rochester, Vt., 2:15 p. m., about August 30, 1937, was kindly supplied by Mr. James Stokley, director, The Fels Planetarium, Franklin Institute, Philadelphia, Pa., with permission by the photographer, Mr. J. W. Sanders, 2216 Rittenhouse Square, Philadelphia, Pa., to publish it.

COMPARISON OF TEMPERATURES FROM ROOF AND GROUND EXPOSURES AT TOPEKA, KANS., 1935–36

By A. D. ROBB

[Weather Bureau, Topeka, Kans., April 1937]

Two temperature records, using standard Weather Bureau instruments, have been maintained at Topeka, Kans., since October 15, 1934—one on the roof of the Federal Building, where the Weather Bureau office is located, and the other at 440 The Drive, about 2½ miles almost due west of the Weather Bureau office. The thermometers at the Weather Bureau office are in a standard instrument shelter, and those at 440 The Drive are in a cooperative observer's instrument shelter. The former thermometers, designated No. 1, are 8 feet above the tar and gravel roof, and 65 feet above the ground; the latter, No. 2, are 5 feet above sod, and have a good exposure. The instrument shelter on the Federal Building is 28 feet north of a penthouse which extends 12.5 feet above the roof of the major portion of the building; the shelter is 4 feet below the level of the roof of the penthouse. Thermometers No. 1 are 60 feet higher than No. 2.

The substation 2 was established in order to determine the difference in temperature at the respective exposures and to determine what, if any, influence the penthouse has on the temperature at station 1. The results of 2 years of observations, 1935–36, are given in tables 1 and 2, and figures 1 to 7.[1]

The mean annual temperatures at the two stations are almost identical. In 1935 the mean temperature at 1 was 55.7°, and at 2 it was 56.1°, 0.4° higher; in 1936 the mean temperature was the same at both stations, 56.5°.

The mean maximum at station 2 was higher than at station 1 in all months of the 2 years; the mean minimum at the substation was as low, or lower, in every case but one, May 1935. At the substation, the extreme maxima have been the higher in all but 5 months. The substation also had the extreme low temperatures in a majority of the months; and only during the winter months did the extreme low temperatures recorded on the roof of the Federal Building equal or exceed those recorded near the ground. At the ground exposure, the temperature was especially lower in hot, dry weather.

To investigate the reasons for the differences found, the daily maxima and the daily minima at the two stations for 1935 and 1936 were compared. Most of the time the maxima at station 2 were the higher; at times as much as 6° difference occurred. When the maximum was higher at the Weather Bureau office the difference never exceeded 2°. The minimum temperatures at the ground station were usually lower than on the roof, the difference sometimes reaching 13°. When the minimum was lower at the roof exposure, the difference did not exceed 2°. See figure 1.

Four elements appear to affect the difference between the maxima at the two exposures, viz, state of weather, wind direction, wind speed, and moisture conditions of the ground. Figure 2 shows that the greater differences tend to occur during clear weather. Figure 3 shows that only southerly winds ordinarily produced higher maxima at the roof exposure than at the ground exposure; the majority of times when the maxima were higher at the roof station occurred in either clear or partly cloudy weather. Of course there is some correlation between wind direction and state of weather; but the observed effects may be due in some measure to the influence of the roof and penthouse. The prevailing wind direction is south. Figure 5 shows that wind speed has little effect.

During the drought conditions of the past two summers, two good examples of the effect of ground moisture have occurred: On June 26, 27, 28, 1935, rain fell, totaling 1.93 inches, which soaked the ground well. During the 16 days, June 26–July 11, 1935, there were only 4 times when the maximum temperature at station 2 was higher than that at station 1, and 12 times when the maximum at 1 was as high as or higher than at 2; but during the 39 days following July 11, a period of light rainfall and temperatures of 100° or over nearly every day, the temperature at station 1 exceeded that at 2 only once. The rapidity with which the roof of the Federal Building dries out, while the soil remains wet, explains the difference.

Again, on June 5, 1936, 1.07 inches of rain fell at the substation, giving the soil abundant moisture. On June 8, the first of many days with a temperature of 100° occurred at the roof station. During the 22 days from June 5 to June 25, inclusive, there were 11 times when the maximum temperature at this station was as high as or higher than at the ground exposure; but during the following 76 days, the maximum temperature at the ground exposure always equaled or exceeded that at the roof exposure. When the September rains came the relation reversed again.

The differences in the minima are also affected by the same four factors. Figure 4 shows the effect of the state of weather. Figure 5 shows a pronounced effect of wind velocity on the difference in the minima; high winds tend to produce a lower temperature at the Weather Bureau office than at the ground station; figure 6 shows the effect of wind velocity in different states of weather. The influence of wind direction is shown in figure 7. No difference between the two minima was usually associated with northerly or easterly winds. South, southwest, or west winds produced temperatures 1° or 2° lower near the ground than on the roof more often than other directions; the greatest range in the differences occurred with west winds.

Dry weather seems to cause lower minima near the ground than on the roof. During 1935 and 1936, there were 10 months with above-normal precipitation; and during those 10 months, there were 56 times when the minimum temperature at the ground was 5° or more lower than on the roof. In contrast, during the 14 months when the precipitation was below normal, there were 110 times when the minimum temperature at the ground was 5° or more lower than on the roof.

The times at which freezing temperatures occur in the fall and spring may also be compared. The record at the two stations now covers three fall seasons and two spring seasons. The first freezing weather in the fall was recorded on the same date at both stations during each year. In the spring of 1935 the last freezing temperature at the Weather Bureau office was recorded on April 15, with a minimum of 30°; and at the substation the last recorded freezing temperature was 32° on April 16, 1 day later. In 1936 the last recorded freezing temperature at the roof exposure was 24° on April 7; after that date,

[1] *Cf.* the similar studies by B. R. Laskowski, Ground temperatures compared to roof temperatures [at Topeka], MON. WEATH. REV., 64: 17, 1936; and C. A. Donnel, Temperature relations between the two Chicago, Ill., Weather Bureau stations, MON. WEATH. REV., 62: 131–132, 1934.

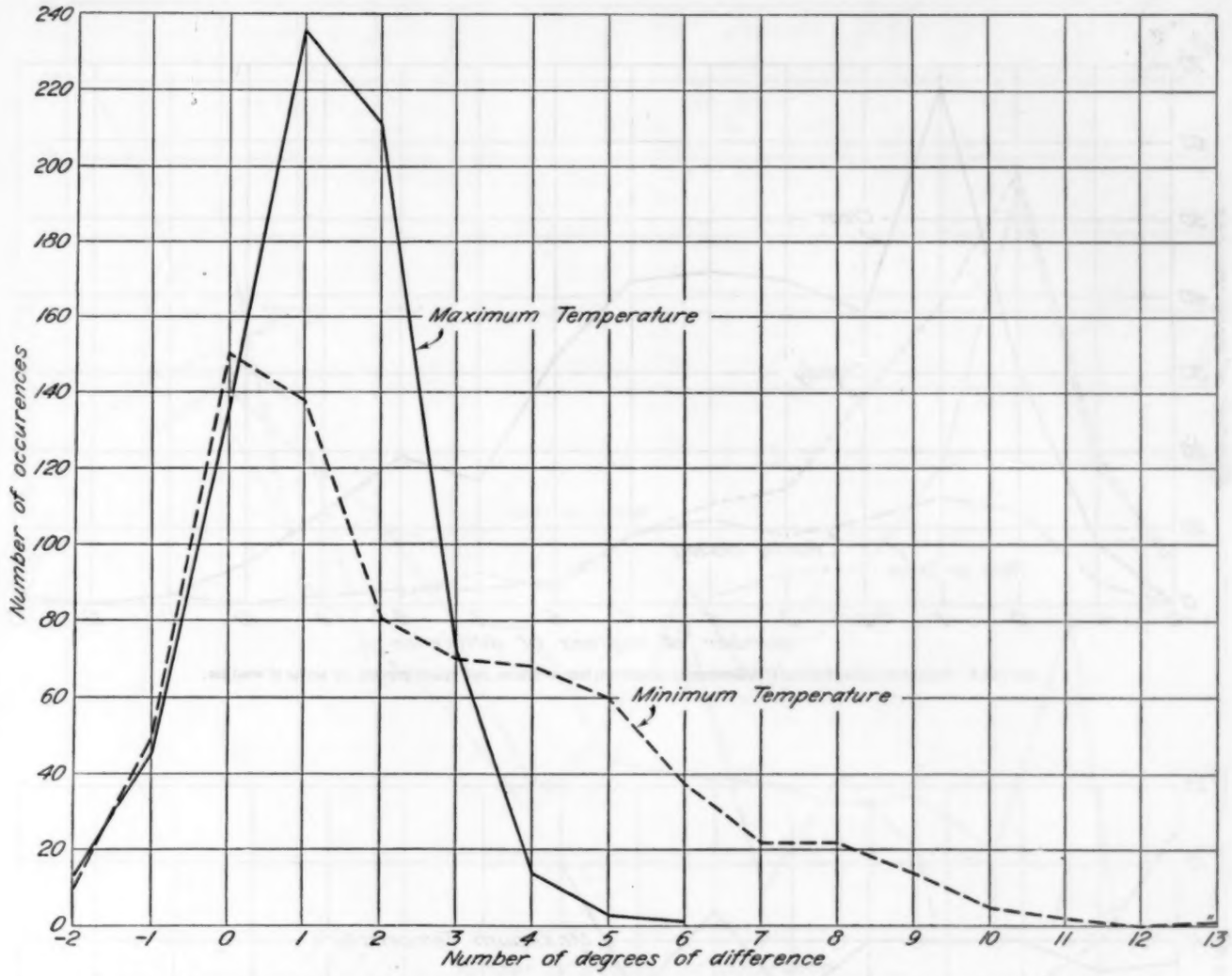

FIGURE 1.—Frequency distributions of differences in maximum temperature (ground minus roof) and minimum temperature (roof minus ground).

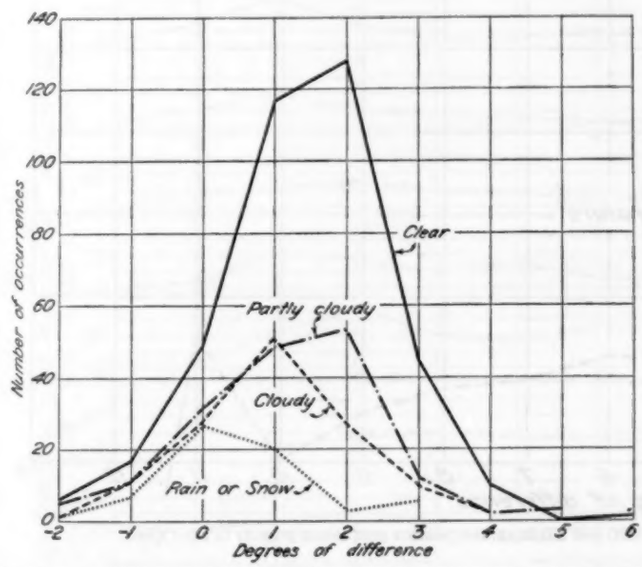

FIGURE 2.—Frequency distribution of differences in maximum temperature, ground minus roof, by states of weather.

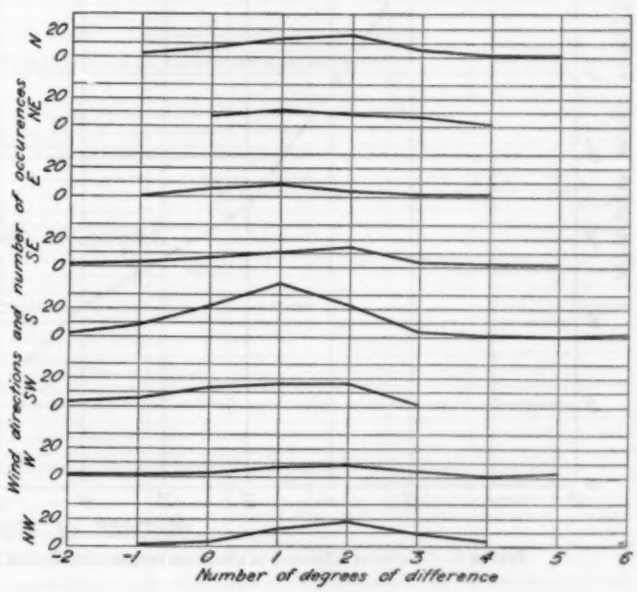

FIGURE 3.—Frequency distribution of differences in maximum temperatures, ground minus roof, by wind directions.

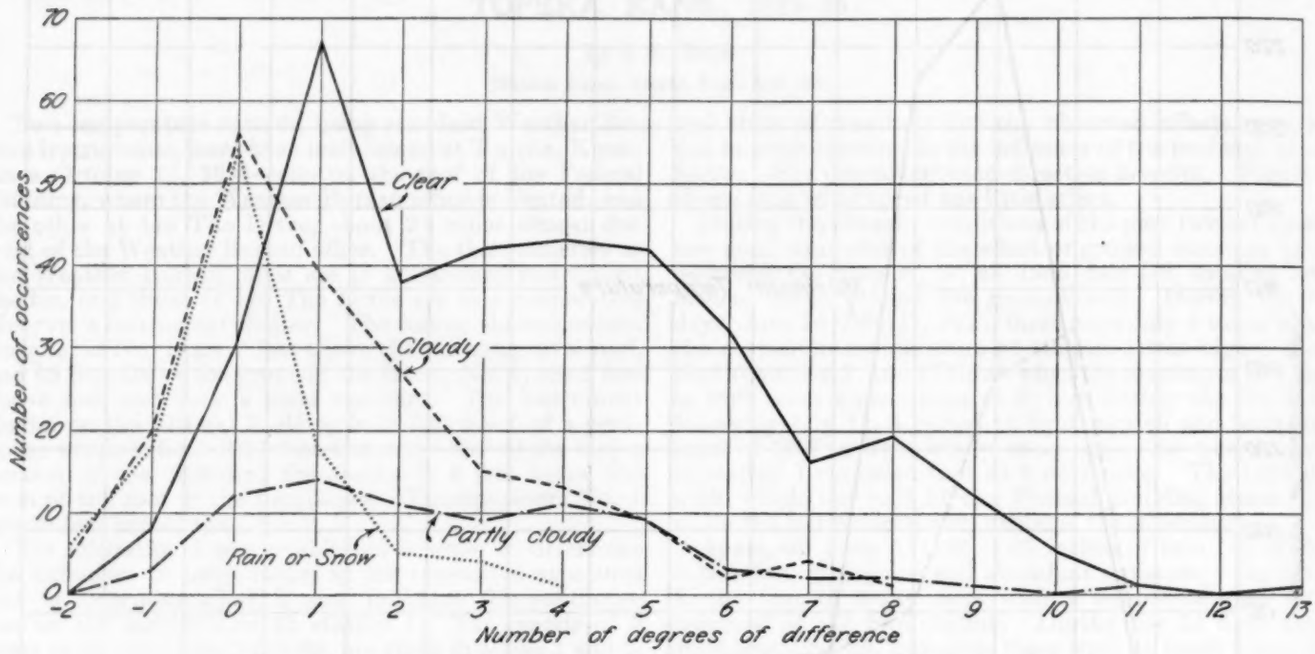

FIGURE 4.—Frequency distributions of differences in minimum temperatures, roof minus ground, by states of weather.

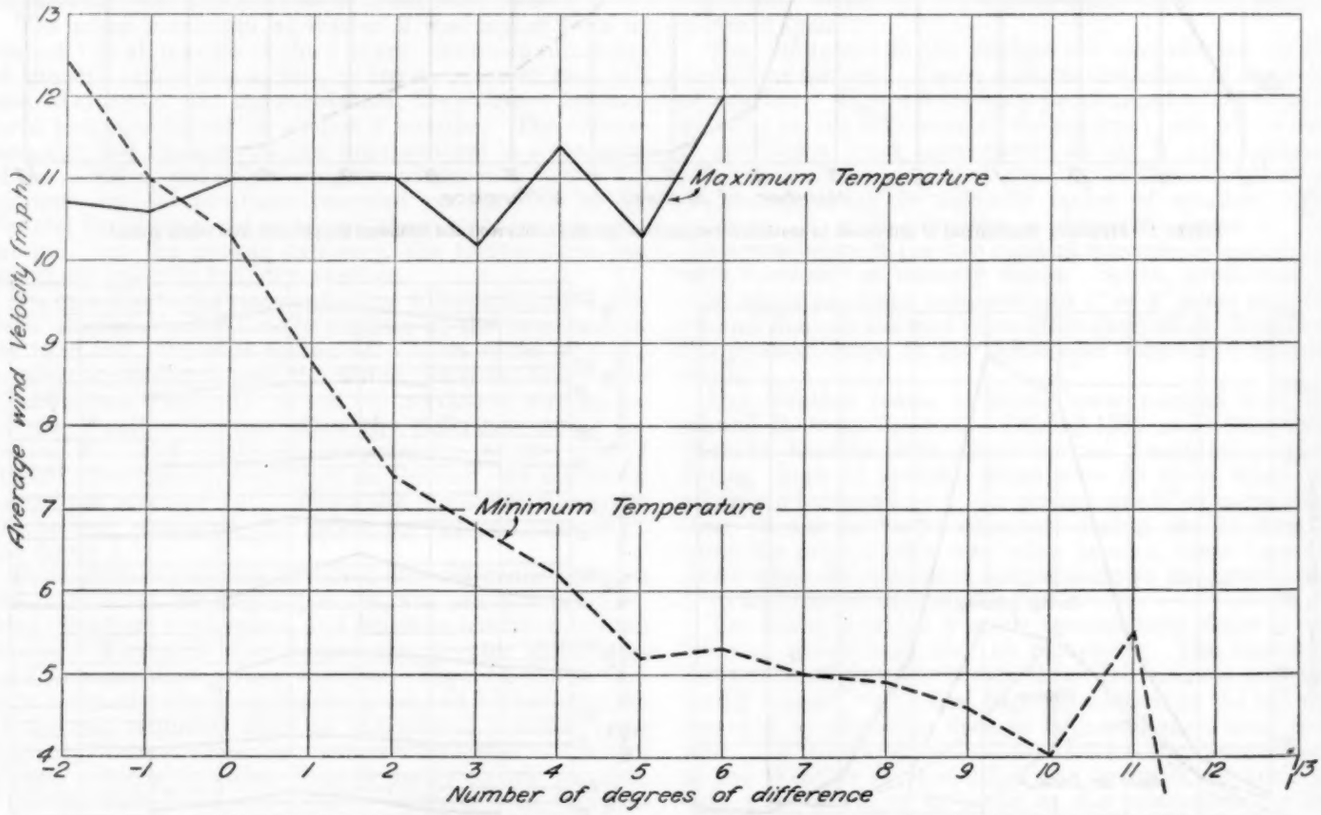

FIGURE 5.—Relation of differences in maximum temperature (ground minus roof) and minimum temperature (roof minus ground) to wind speed.

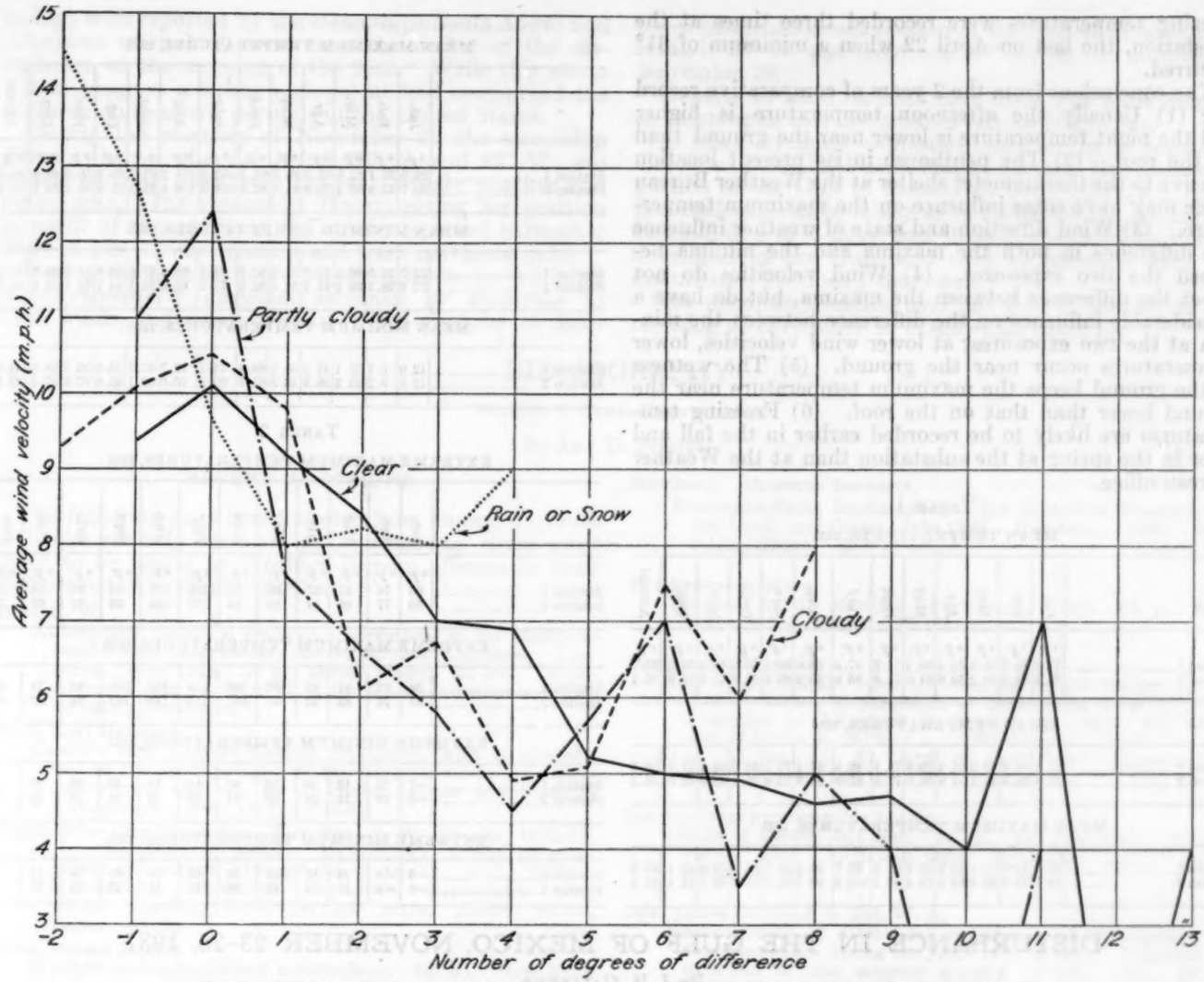

FIGURE 6.—Relation of difference in minimum temperature, roof minus ground, to wind speed and state of weather.

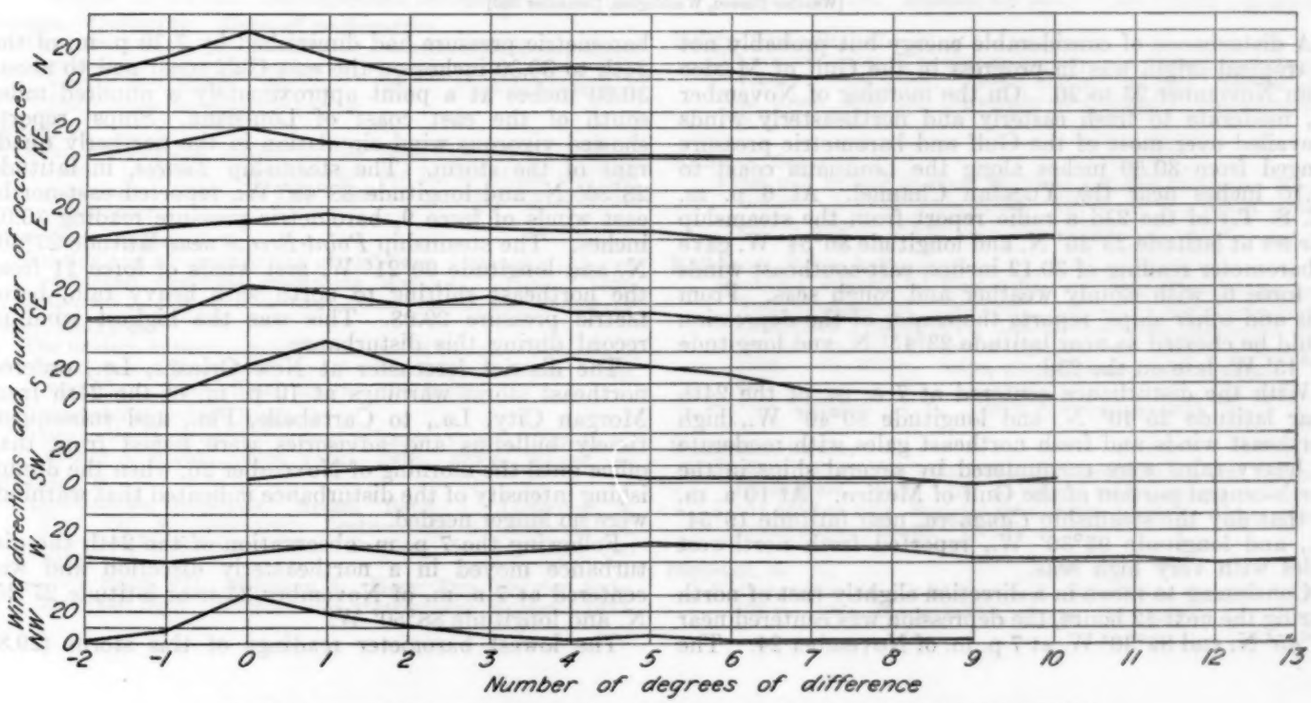

FIGURE 7.—Frequency distribution of differences in minimum temperatures, roof minus ground, by wind directions.

freezing temperatures were recorded three times at the substation, the last on April 22 when a minimum of 31° occurred.

The conclusions from the 2 years of comparative record are: (1) Usually the afternoon temperature is higher and the night temperature is lower near the ground than on the roof. (2) The penthouse in its present location relative to the thermometer shelter at the Weather Bureau office may have some influence on the maximum temperature. (3) Wind direction and state of weather influence the difference in both the maxima and the minima between the two exposures. (4) Wind velocities do not affect the difference between the maxima, but do have a considerable influence on the difference between the minima at the two exposures; at lower wind velocities, lower temperatures occur near the ground. (5) The wetness of the ground keeps the maximum temperature near the ground lower than that on the roof. (6) Freezing temperatures are likely to be recorded earlier in the fall and later in the spring at the substation than at the Weather Bureau office.

TABLE 1

MEAN TEMPERATURES, 1935

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec	Annual
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Station 1	33.2	36.7	51.0	52.4	59.4	71.2	87.0	80.0	69.1	56.2	40.8	32.2	55.7
Station 2	33.3	38.4	52.2	52.6	61.0	71.6	85.8	80.2	68.6	56.6	40.8	32.0	56.1

MEAN TEMPERATURES, 1936

Station 1	21.2	19.4	49.0	54.4	69.8	78.4	88.4	87.4	73.2	56.0	43.1	37.8	56.5
Station 2	21.8	20.8	49.3	54.8	69.0	77.5	87.0	86.7	73.6	56.4	42.9	38.0	56.5

MEAN MAXIMUM TEMPERATURES, 1935

Station 1	41.6	44.9	61.8	62.8	67.6	81.8	99.7	91.6	80.7	66.4	48.4	40.1	65.6
Station 2	44.0	48.6	65.0	63.9	70.4	83.2	100.2	93.5	82.0	68.6	49.5	41.4	67.5

MEAN MAXIMUM TEMPERATURES, 1936

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Station 1	29.6	29.1	62.8	67.5	80.7	92.3	102.5	101.2	83.7	66.2	56.0	46.9	68.2
Station 2	30.7	32.3	65.4	70.8	81.6	93.5	104.3	103.4	85.2	68.9	58.2	48.7	70.2

MEAN MINIMUM TEMPERATURES, 1935

Station 1	22.7	28.5	40.3	42.0	51.1	60.7	74.4	68.5	57.5	46.0	33.3	24.4	45.8
Station 2	22.6	28.3	39.3	41.3	51.5	59.9	71.5	66.9	55.1	44.7	32.5	22.6	44.7

MEAN MINIMUM TEMPERATURES, 1936

Station 1	12.9	9.7	35.1	41.2	58.9	64.4	74.2	73.7	62.7	45.9	30.2	28.8	44.8
Station 2	12.9	9.2	33.2	38.9	56.5	61.5	69.8	70.0	62.1	43.8	27.6	27.4	42.7

TABLE 2

EXTREME MAXIMUM TEMPERATURES, 1935

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
Station 1	66	74	87	85	90	94	106	108	93	85	68	57
Station 2	66	77	88	87	89	94	108	108	93	87	69	58

EXTREME MAXIMUM TEMPERATURES, 1936

Station 1	56	76	81	91	92	109	114	113	105	85	78	66
Station 2	55	74	83	93	91	107	115	116	107	86	80	67

EXTREME MINIMUM TEMPERATURES, 1935

Station 1	−7	10	13	30	38	45	66	51	40	28	25	4
Station 2	−6	10	14	28	38	44	58	48	34	25	22	4

EXTREME MINIMUM TEMPERATURES, 1936

Station 1	−6	−9	19	16	46	50	60	60	49	28	16	8
Station 2	−6	−9	19	14	42	46	52	51	47	23	16	8

DISTURBANCE IN THE GULF OF MEXICO, NOVEMBER 23–26, 1937

By J. H. GALLENNE

[Weather Bureau, Washington, December 1937]

A disturbance of considerable energy but probably not of tropical origin was in progress in the Gulf of Mexico from November 23 to 26. On the morning of November 23, moderate to fresh easterly and northeasterly winds prevailed over most of the Gulf and barometric pressure ranged from 30.50 inches along the Louisiana coast to 30.10 inches near the Yucatan Channel. At 6 p. m. (E. S. T.) of the 23d a radio report from the steamship *Tivives* at latitude 23°36′ N. and longitude 86°54′ W. gave a barometer reading of 30.12 inches, east-southeast winds of force 6, with cloudy weather and rough seas. From this and other ships' reports the center of the depression could be charted as near latitude 23°45′ N. and longitude 89°45′ W. late on the 23d.

With the disturbance centered at 7 a. m. of the 24th near latitude 25°10′ N. and longitude 89°40′ W., high northeast winds and fresh northeast gales with moderate to heavy rains were encountered by several ships in the north-central portion of the Gulf of Mexico. At 10 a. m. of that day the steamship *Cananova*, near latitude 19°54′ N., and longitude 93°30′ W., reported fresh northwest gales with very high seas.

Continuing to move in a direction slightly east of north during the next 12 hours, the depression was centered near 26°45′ N. and 89°30′ W. at 7 p. m. of November 24. The barometric pressure had diminished by 7:30 p. m. of the 24th to 30.30 inches on the east Gulf coast and to about 30.00 inches at a point approximately a hundred miles south of the east coast of Louisiana. Ships' reports showed vigorous wind circulation in the northerly quadrant of the storm. The steamship *Tivives*, in latitude 28°36′ N. and longitude 88°48′ W., reported east-northeast winds of force 9, barometric pressure reading 30.03 inches. The steamship *Point Breeze* near latitude 27°40′ N. and longitude 90°21′ W. met winds of force 11 from the northeast shifting to north with heavy rain, barometric pressure 29.98. This was the highest wind of record during this disturbance.

The district forecaster at New Orleans, La., ordered northeast storm warnings at 10 p. m. of the 24th from Morgan City, La., to Carrabelle, Fla., and subsequent timely bulletins and advisories were issued from that office until the morning of November 26, when the diminishing intensity of the disturbance indicated that warnings were no longer needed.

Following the 7 p. m. observation of the 24th the disturbance moved in a northeasterly direction and was centered at 7 a. m. of November 25 near latitude 27°25′ N. and longitude 88°50′ W.

The lowest barometer readings of this storm (29.83

inches) were reported by the steamships *Santa Marta* and *Munplace* when both were near the center of the disturbance on the morning of the 25th. While this storm was in progress a strong anticyclone had overspread the southern and eastern portions of the United States.

During the morning of November 25 the steamship *Satoco*, when in the vicinity of 28° N. and 87° W., encountered fresh gales from the east, cloudy weather and heavy seas. The steamship *Tivives*, giving her position as north of the center of the storm, reported barometer 29.94 inches, cloudy weather and fresh northeast gales.

During the next 24 hours the disturbance moved in an east-northeasterly direction attended by moderate to fresh winds, and rising pressure. The disturbance dissipated in the northeast portion of the Gulf of Mexico, near latitude 28° N. and longitude 87° W. on the morning of November 26.

Reports at hand indicate that there was some damage to shipping in this disturbance but no loss of life.

A weak cyclonic depression moving in a southerly direction from the Plains States, reached the southwest portion of the Gulf of Mexico on November 19. There is considerable uncertainty as to its movement during the succeeding 3 or 4 days, but there are indications that it developed in the Gulf, and may be identical with the disturbance previously described.

The synoptic situation over the Gulf of Mexico on the morning of November 25 is shown in chart IX.

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By AMY D. PUTNAM

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SOLAR OBSERVATIONS

SOLAR OBSERVATIONS DURING NOVEMBER 1937

By CHARLES M. LENNAHAN

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

Table 1 shows that the solar radiation intensities averaged above normal, on the whole, at Washington, Madison, and Blue Hill; and close to normal at Lincoln.

Table 2 shows an excess in the amount of total solar and sky radiation received on a horizontal surface during the month at all stations except Washington, Twin Falls, Riverside, and Friday Harbor.

Polarization observations made at Madison on 4 days give a mean of 58 percent with a maximum of 60 percent on the 9th; both values are below normal.

TABLE 1.—*Solar radiation intensities during November 1937*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
1937	*mm.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Nov. 3	3.45	0.86	0.96	1.14							3.15
Nov. 4	4.37	.69	.78	.94	1.18		1.12	1.01	0.93	0.68	2.74
Nov. 8	5.79						1.28				5.56
Nov. 9	10.21				1.44		1.41	1.24	1.10	1.03	4.16
Nov. 10	4.96				1.14		1.12				3.30
Nov. 17	5.56			1.02	1.19						3.99
Nov. 22	2.37	.80	.95	1.05	1.26						1.96
Nov. 23	2.37	.59	.71	.89	1.19		1.21	1.08	.92	.69	2.26
Nov. 24	2.74	.90	1.08	1.20	1.38		1.35				2.62
Nov. 29	3.15							1.12	.95	.71	2.74
Nov. 30	4.37	.67	.86	1.02	1.32			.86	.70	.56	3.64
Means		.75	.89	1.04	1.26		1.25	1.06	.92	.73	
Departures		.00	+.02	+.03	+.07		+.07	+.05	+.07	−.01	

TABLE 1.—*Solar radiation intensities during November 1937*—Con.

MADISON, WIS.

Date	Sun's zenith distance: 8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Nov. 3	2.49							1.16			2.74
Nov. 9	4.37		0.80	1.05	1.33						4.16
Nov. 10	5.16		1.02	1.20	1.32						5.56
Nov. 12	4.57			.89	1.10						4.96
Nov. 22	1.52	1.01	1.21								1.96
Nov. 30	.96	.93	1.08	1.28							1.52
Means		(.97)	1.03	1.10	1.28			(1.16)			
Departures		(+.08)	+.03	−.05	−.03			(+.04)			

LINCOLN, NEBR.

Nov. 2	3.64	1.05	1.17	1.26	1.43	1.58					3.99
Nov. 11	4.75	.81	.96	1.09	1.28	1.65					4.37
Nov. 12	5.36						.72				3.30
Nov. 13	4.37	.90	1.06	1.09							3.30
Nov. 20	1.20	1.21	1.29	1.42	1.57		1.57	1.39	1.29		1.45
Nov. 25	4.75	.79	.99	1.17	1.41			1.27		1.06	4.16
Nov. 26	3.81	1.04	1.15	1.26	1.44		1.40	1.20	1.05	.96	4.96
Nov. 27	2.26	1.04	1.15	1.26	1.44					1.06	1.96
Nov. 29	1.67			1.14	1.44			1.21	1.03		1.78
Means		.97	1.10	1.20	1.43	(1.62)	1.23	1.27	1.12	1.01	
Departures		+.05	+.07	+.02	+.07	(+.06)	−.12	+.09	+.08	+.08	

BLUE HILL, MASS.

Nov. 1	2.8	0.72	0.88	1.04	1.32						3.0
Nov. 3	3.3	.96	1.05	1.16	1.31				1.21	1.09	3.6
Nov. 4	3.6	.90	1.01	1.14	1.30						3.2
Nov. 7	3.3			1.06	1.13		1.13	0.95	.85		4.4
Nov. 9	9.9						1.27	1.07	.96		8.2
Nov. 10	3.3	.48	.65	.96	1.29		1.28	1.21	1.11	1.05	4.0
Nov. 11	1.6	1.02	1.14	1.27	1.41		1.40	1.29	1.14	1.06	1.8
Nov. 16	4.8		.92	1.10	1.34						4.2
Nov. 18	4.8						1.26	1.14	1.06	1.01	4.2
Nov. 22	2.4	.93	.99	1.05	1.24						2.4
Nov. 23	2.2	1.09	1.18	1.27	1.44		1.43	1.29	1.14	1.00	1.9
Nov. 29	5.4		1.06	1.15	1.40		1.40	1.14	1.00		3.2
Nov. 30	3.0	.99	1.02	1.11	1.20		1.20	1.11	1.05	.92	3.2
Means		.88	.99	1.12	1.31		1.30	1.15	1.04	1.02	
Departures		−.09	−.06	−.02	+.03		+.03	+.01	+.04	+.15	

* Interpolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Gram-calories per square centimeter															
	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	San Juan	Friday Harbor	Ithaca	Newport
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Oct. 29	275	262	278	267	258	330	55	239	303	369	347	295	488	149	168	266
Nov. 5	231	253	300	194	208	305	39	180	250	333	301	229	457	104	147	233
Nov. 12	164	132	193	95	126	276	45	119	292	330	223	253	441	70	87	149
Nov. 19	194	179	204	152	148	205	28	109	293	298	162	263	425	71	121	158
Nov. 26	147	171	204	153	112	254	10	160	232	244	229	240	349	96	111	135
	Departures from weekly normals															
Oct. 29	+27	+69	+38	+113	+78	+13	+15	+13	.....	+44	+67	−9	.....	+12	+22	.....
Nov. 5	+6	+79	+54	+63	+56	−2	+8	−29	.....	+35	+25	−78	.....	−12	+18	.....
Nov. 12	−30	−16	−13	−6	−1	+28	+15	−43	.....	−10	−15	−42	.....	−22	−23	.....
Nov. 19	+5	+44	−2	+33	+20	−28	+8	−45	.....	−27	+35	−7	.....	−25	+17	.....
Nov. 26	−16	+40	+18	+62	+3	+30	−3	+12	.....	−36	+22	−18	.....	−2	+17	.....
	Accumulated departures on—															
	+126	+9,516	+5,439	+6,811	+6,580	+8,414	+2,842	−1,876	.....	−8,743	+5,180	−4,571	.....	−2,002	−6,769	.....

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Mt. Wilson group No.	Heliographic			Area		Total area for each day	Observatory
			Diff. in longitude	Longitude	Latitude	Spot	Group		
1937	h. m.		°	°	°				
Nov. 1	11 7	5622	−23.0	146.7	+7.0	.....	533	.....	U. S. Naval.
		5620	−28.5	141.2	−11.0	.....	121	.....	
		5618	−15.0	154.7	+11.0	48	.....	.....	
		5614	+10.0	179.7	+7.5	.....	12	.....	
		5614	+23.0	192.7	+5.0	.....	194	.....	
		5621	+13.0	182.7	−10.5	.....	170	.....	
		5617	+27.0	196.7	−10.5	.....	12	.....	
		5616	+29.0	198.7	+13.5	6	.....	.....	
		5613	+35.0	204.7	−30.0	194	.....	.....	
		5623	+35.0	204.7	+9.5	.....	73	1,363	
Nov. 2	11 12	5627	−78.0	78.4	−9.0	.....	48	.....	Do.
		5620	−13.0	143.4	−11.0	.....	170	.....	
		5625	−10.0	146.4	−17.5	12	.....	.....	
		5622	−10.0	146.4	+7.0	.....	582	.....	
		5618	−2.0	154.4	+11.0	48	.....	.....	
		5621	+27.0	183.4	−10.5	.....	291	.....	
		5614	+36.0	192.4	+5.0	.....	97	.....	
		5616	+43.5	199.9	+14.0	12	.....	.....	
		5623	+49.0	205.4	+10.0	.....	24	.....	
		5613	+50.0	206.4	−29.0	.....	218	1,502	
Nov. 3	11 15	5627	−65.0	78.2	−8.0	.....	73	.....	Mt. Wilson.
		5620	0.0	143.2	−10.5	.....	170	.....	
		5622	+4.0	147.2	+8.0	.....	533	.....	
		5618	+11.0	154.2	+12.0	.....	36	.....	
		5621	+41.0	184.2	−10.0	.....	291	.....	
		5628	+46.0	189.2	+27.0	.....	24	.....	
		5614	+54.0	197.2	+4.5	.....	73	.....	
		5616	+57.0	200.2	+14.0	.....	48	.....	
		5623	+63.0	206.2	+10.0	24	.....	.....	
		5613	+64.0	207.2	−28.0	.....	218	1,490	
Nov. 4	11 28	5627	−50.0	79.9	−8.0	.....	48	.....	U. S. Naval.
		5630	−24.0	105.9	−17.5	.....	12	.....	
		5620	+13.0	142.9	−10.5	.....	170	.....	
		5622	+18.5	148.4	+7.0	.....	339	.....	
		5618	+25.0	154.9	+12.0	24	.....	.....	
		5621	+56.0	185.9	−11.0	.....	145	.....	
		5629	+58.0	187.9	−28.0	.....	48	.....	
		5628	+60.0	189.9	+27.0	6	.....	.....	
		5614	+67.0	196.9	+4.0	.....	6	.....	
		5616	+70.0	199.9	+14.0	6	.....	.....	
		5613	+74.0	203.9	−29.0	.....	97	901	
Nov. 5	11 14	5627	−36.0	80.9	−7.0	.....	48	.....	Mt. Wilson.
		5630	−8.0	108.9	−16.5	.....	24	.....	
		5620	+27.0	143.9	−9.0	.....	145	.....	
		5622	+32.0	148.9	+7.0	.....	194	.....	
		5618	+38.0	154.9	+12.0	12	.....	.....	
		5621	+71.0	187.9	−11.0	97	.....	.....	
		5629	+72.0	188.9	−27.0	.....	242	762	
Nov. 6	11 39	5627	−22.0	81.4	−8.0	.....	48	.....	U. S. Naval.
		5620	+42.0	145.4	−9.0	48	.....	.....	
		5622	+46.0	149.4	+8.0	.....	97	.....	
		5629	+85.0	188.4	−29.0	97	.....	.....	
		5621	+88.0	189.4	−11.0	48	.....	338	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic			Area		Total area for each day	Observatory
			Diff. in longitude	Longitude	Latitude	Spot	Group		
	h. m.		°	°	°				
Nov. 7	13 9	5631	−81.0	8.4	+21.0	388	.....	.....	U. S. Naval.
		5627	−7.5	81.9	−8.0	.....	48	.....	
		5622	+50.0	148.4	+8.0	.....	24	460	
Nov. 8	11 2	5632	−71.0	6.4	−15.0	.....	485	.....	Do.
		5631	−68.0	9.4	+21.0	.....	388	.....	
		5633	−50.0	27.4	+14.0	.....	121	.....	
		5627	+6.0	83.4	−8.0	.....	48	1,042	
No. 9	11 0	5632	−58.5	5.7	−16.0	.....	630	.....	Do.
		5631	−53.5	10.7	+21.0	.....	339	.....	
		5633	−47.0	17.2	+13.0	.....	145	.....	
		5635	+1.0	65.2	−15.0	.....	12	.....	
		5627	+19.5	83.7	−8.0	36	.....	.....	
		5634	+44.0	108.2	+16.0	12	.....	1,174	
Nov. 10	11 15	5632	−45.0	5.9	−16.5	.....	727	.....	Do.
		5631	−41.0	9.9	+21.0	.....	291	.....	
		5633	−23.0	27.9	+12.5	.....	121	.....	
		5635	+14.0	64.9	−14.5	.....	48	.....	
		5627	+33.5	84.4	−8.0	24	.....	1,211	
Nov. 11	11 18	5632	−31.5	6.2	−16.5	.....	727	.....	Do.
		5631	−29.0	8.7	+21.0	.....	291	.....	
		5633	−9.0	28.7	+12.0	.....	121	.....	
		5635	+27.0	64.7	−15.0	.....	291	.....	
		5627	+46.0	83.7	−8.0	24	.....	1,454	
Nov. 12	11 9	5637	−69.5	315.1	+7.0	.....	48	.....	Mt. Wilson.
		5636	−30.0	354.6	−22.0	24	.....	.....	
		5632	−18.0	6.6	−15.0	.....	824	.....	
		5631	−14.0	10.6	+22.0	.....	339	.....	
		5633	+7.0	31.6	+11.0	.....	121	.....	
		5635	+41.0	65.6	−15.0	.....	291	1,647	
Nov. 13	13 57	5637	−56.0	313.9	+7.0	.....	48	.....	Do.
		5637	−49.0	320.9	+11.0	24	.....	.....	
		5636	−19.0	350.9	−23.0	.....	36	.....	
		5639	−35.0	334.9	−13.0	12	.....	.....	
		5632	−4.0	5.9	−15.0	.....	679	.....	
		5631	+6.5	10.4	+22.0	.....	242	.....	
		5633	+25.0	34.9	+11.0	.....	73	.....	
		5635	+55.0	64.9	−13.0	.....	242	.....	
		5638	+70.0	79.9	−9.0	.....	48	1,404	
Nov. 14	13 20	5637	−41.0	316.1	+6.0	24	.....	.....	U. S. Naval.
		5639	−19.0	338.1	−16.0	.....	48	.....	
		5632	+9.0	6.1	−16.0	.....	630	.....	
		5631	+13.5	10.6	+22.0	194	.....	.....	
		5633	+39.5	36.6	+11.0	.....	73	.....	
		5635	+70.0	67.1	−13.0	206	.....	1,175	
Nov. 15	11 19	5641	−82.0	263.0	+20.0	97	.....	.....	Do.
		5637	−29.0	316.0	+6.0	24	.....	.....	
		5639	−8.5	336.5	−16.0	.....	12	.....	
		5632	+22.0	7.0	−16.0	.....	533	.....	
		5631	+25.5	10.5	+22.0	194	.....	.....	
		5633	+53.0	38.0	+11.0	97	.....	.....	
		5635	+84.0	69.0	−13.0	97	.....	1,054	
Nov. 16	11 6	5641	−70.0	261.9	+20.5	121	.....	.....	Do.
		5640	−37.0	294.9	−21.0	.....	97	.....	
		5637	−9.0	322.9	+9.0	.....	36	.....	
		5642	+31.0	2.9	+10.5	24	.....	.....	
		5632	+38.0	6.9	−15.5	.....	533	.....	
		5631	+39.0	10.9	+22.0	194	.....	.....	
		5633	+67.0	38.9	+11.0	97	.....	1,102	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
	h. m.		°	°	°				
Nov. 17	11 5	5645	−84.0	234.7	−18.5	291			U. S. Naval.
		5641	−57.5	261.2	+20.0	97			
		5644	−27.0	291.7	−18.5		48		
		5640	−22.0	296.7	−22.0		97		
		5637	+4.5	323.2	+9.5		73		
		5643	+31.0	349.7	−22.0		48		
		5632	+48.0	6.7	−15.5		388		
		5631	+51.0	9.7	+22.0	194			
		5633	+80.0	38.7	+11.0	97		1,333	
Nov. 18	11 26	5645	−69.0	236.4	−18.5	291			Do.
		5641	−45.0	260.4	+20.0	73			
		5644	−13.5	291.9	+18.5		145		
		5640	−9.0	296.4	−24.0		73		
		5637	+19.5	324.9	+10.5		73		
		5643	+44.0	349.4	−21.0		36		
		5632	+62.0	7.4	−17.0		291		
		5631	+63.0	8.4	+21.0	194		1,176	
Nov. 19	11 24	5645	−56.0	236.2	−18.0	388			Mt. Wilson.
		5641	−31.5	260.7	+21.0	61			
		5644	+1.0	293.2	−18.5		145		
		5640	+3.0	295.2	−22.0		36		
		5637	+33.0	325.2	+11.0		97		
		5643	+59.0	351.2	−21.0		36		
		5632	+77.0	9.2	−17.0	291			
		5631	+78.0	10.2	+22.0	170		1,224	
Nov. 20	11 18	5647	−76.0	203.1	+6.0	24			U. S. Naval.
		5645	−42.0	237.1	−19.0	242			
		5641	−18.5	260.6	+21.0	61			
		5644	+13.5	292.6	−17.5	73			
		5637	+44.0	323.1	+10.5		24		
		5646	+61.0	340.1	−20.0	6		430	
Nov. 21	11 47	5650	−71.0	194.6	−26.0	12			Mt. Wilson.
		5647	−63.0	202.6	+7.0	24			
		5649	−51.0	214.6	−8.0	12			
		5645	−29.5	236.1	−19.0	339			
		5641	−4.0	261.6	+22.0		97		
		5644	+31.0	296.6	−15.0	61		545	
Nov. 22	11 4	5654	−80.0	172.8	+10.0		12		U. S. Naval.
		5653	−63.0	189.8	+12.0		97		
		5647	−50.0	202.8	+6.0	36			
		5645	−16.0	236.8	−19.0	291			
		5641	+8.5	261.3	+19.5	48			
		5644	+42.0	294.8	−14.0	24		508	
Nov. 23	11 4	5654	−66.0	173.7	+9.0	12			Do.
		5653	−50.0	189.7	+13.0		24		
		5647	−36.0	203.7	+7.0	12			
		5655	−14.5	225.2	+18.0	12			
		5645	−3.5	236.2	−19.5	242			
		5641	+20.5	260.2	+20.0	48			
		5648	+29.0	268.7	+8.0	6		356	
Nov. 24	11 6	5653	−38.0	188.5	+13.0		73		Do.
		5647	−22.5	204.0	+7.0	12			
		5645	+10.0	236.5	−19.0	242			
		5641	+33.5	260.0	+20.0	48		375	
Nov. 25	10 58	5653	−27.0	186.3	+15.0	12			Mt. Wilson.
		5657	−15.0	198.3	−12.0	6			
		5647	−8.0	205.3	+7.5	12			
		5656	+11.0	224.3	+10.0	24			
		5645	+23.0	236.3	−18.0	218			
		5641	+48.0	261.3	+21.0	36		308	
Nov. 26	11 44	5654	−22.5	177.2	+10.5		36		Do.
		5660	−8.5	191.2	+7.0		61		
		5653	−6.0	193.7	+13.0		24		
		5659	+25.0	224.7	+18.5		36		
		5656	+25.5	225.2	+9.5		97		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot	Area: Group	Total area for each day	Observatory
	h. m.		°	°	°				
Nov. 26	11 44	5645	+36.0	235.7	−18.0	218			Mt. Wilson.
		5658	+58.0	257.7	+30.0	24			
		5641	+60.0	259.7	+20.5	36		532	
Nov. 27	11 23	5661	−15.0	171.8	−17.0		36		Do.
		5660	+5.0	191.8	+7.0		48		
		5656	+37.5	224.3	+9.5		194		
		5659	+39.0	225.8	+19.0		145		
		5645	+49.5	236.3	−18.0	218		641	
Nov. 28	10 58	5664	−79.5	94.3	−9.0		24		Do.
		5663	−70.0	103.8	+12.0		12		
		5661	−2.5	171.3	−17.5		16		
		5660	+17.0	190.8	+7.0	16			
		5656	+51.0	224.8	+10.0		339		
		5659	+51.0	224.8	+19.0		145		
		5645	+62.0	235.8	−18.5	218			
		5662	+85.0	258.8	−24.5		97	867	
Nov. 29	11 30	5664	−65.0	95.3	−9.5	36			U. S. Naval.
		5666	−14.5	145.8	−10.0		48		
		5665	+4.0	164.3	−17.0		24		
		5656	+64.0	224.3	+9.5		194		
		5659	+67.0	227.3	+19.0		73		
		5645	+75.0	235.3	−18.0		218	593	
Nov. 30	11 4	5664	−50.0	97.4	−10.0	36			Do.
		5666	−2.5	144.9	−9.5	36			
		5656	+78.0	225.4	+9.0	97			
		5659	+79.0	226.4	+19.0		48	217	

Mean daily area for 30 days, =903.

PROVISIONAL SUNSPOT RELATIVE NUMBERS, NOVEMBER 1937

[Dependent alone on observations at Zurich and its station at Arosa]

[Furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

November 1937	Relative numbers	November 1937	Relative numbers	November 1937	Relative numbers
1	104	11	79	21	60
2		12	83	22	
3	*aa* 103	13	*ab* 100	23	*a* 58
4	67	14	106	24	
5	*Wc* 68	15	74	25	*Mc*
6	49	16	69	26	*Mc* 70
7	*d* 34	17	*Ec*	27	96
8	*d* 47	18	*d* 90	28	64
9	*Mc*	19		29	68
10	*Ec*	20	82	30	47

Mean, 22 days=73.5.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity; *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in Charge]

By LOYD A. STEVENS

Mean free-air data, based on airplane weather observations during the month of November 1937, are given in tables 1 to 3. A description of the methods by which the various monthly means and normals therein are computed may be found in the aerological sections of the MONTHLY WEATHER REVIEW for January and March 1937.

It will be noted that many of the "normals" are based on only 3 years of observations. Conclusions based on departures from such short period "normals" must be used with caution.

The mean surface temperatures for November (see Chart I) were generally above normal over the western third of the country, also over New England and the east portion of the North Atlantic states, and below normal elsewhere. The greatest positive departures (+2° to 3° C.) occurred over the central Rocky Mountain region. The negative departures were, for the most part between −1° and −2° C.

With a few exceptions the mean free-air temperatures for the month up to 5 kilometers were below normal. The most significant positive departures occurred over

Boston, below 2 kilometers, over El Paso, below 2.5 kilometers, and over San Diego above 2 kilometers. The greatest positive departures (+1.5° C.) occurred over Boston at 0.5 kilometer and over El Paso at 1.5 kilometers. The greatest negative departures occurred in the higher levels over Spokane (−4.4° C. at 5 km) and over Lakehurst (−5.0° C. at 4 km). The highest mean temperatures at all levels occurred over San Diego. The lowest mean temperature occurred over Fargo at 0.5 kilometer and over Sault Ste. Marie at all other levels. Above 3 kilometers, however, the mean temperatures at Fargo and Spokane were nearly as low as at Sault Ste. Marie. In general the mean free-air temperatures for November were lower than for October at all levels by 4° to 6° C. The greatest decrease in the mean temperature occurred at Omaha at 0.5 kilometers, where the value for November (+0.9° C.) was 9.5° C. lower than that for October (+10.4° C.).

The mean free-air relative humidities, shown in table 2, were near normal in the lower levels except at Lakehurst, where a marked negative departure was recorded, and at San Diego, where there was a marked positive departure. Above 1.5 kilometers the departures were positive at most stations, although negative departures of between −4 percent and −8 percent were recorded at Pensacola. The greatest positive departure (+24 percent) occurred at San Diego at 0.5 kilometers and the greatest negative departure (−12 percent) occurred at Lakehurst at 1 kilometer.

The mean free-air barometric pressures are shown in table 3. In general there was a decrease in the average pressure for November as compared with that for October, except that in the lower levels, there were small increases of 1 to 3 millibars over the southeast portion of the country. The mean free-air isobaric charts as drawn from the values in table 3 were characterized by a well-defined statistical center of low pressure over the region of the Great Lakes, the lowest mean pressure for the entire country occurring at Sault Ste. Marie at all levels. The highest mean pressure occurred over the southeastern States in the lower levels and over the northern portion of the Gulf States and San Diego in the higher levels. There was, in general, a marked steepening of the south to north pressure gradient across the eastern part of the country in November as compared with October.

Free-air resultant winds, based on pilot-balloon observations made near 5 a. m. (75th meridian time), are shown in table 4. For the most part the resultant wind directions were remarkably close to the normal at nearly all stations and at all levels. The most outstanding exception occurred at Oakland, where the current directions at the different levels varied between 207° (SSW.) and 299° (WNW.) while the normal directions vary between 13° (NNE.) and 333° (NNW.). A similar variation occurred also at San Diego between 2 and 3 kilometers. Resultant velocities were in general, above normal over the northeastern part of the country in the lower levels and over that portion of the country west of a line drawn between Houston and Spokane at all levels. Elsewhere they were below normal. The greatest negative departure from the normal (−4.4 m. p. s.) occurred over Oklahoma City at 3 kilometers and the greatest positive departure (+5.7 m. p. s.) occurred over Albuquerque at 5 kilometers.

Table 5 shows the maximum free-air wind velocities and their directions for various sections of the United States during November, as determined by pilot balloon observations. The extreme maximum for the month was 56.4 meters per second from the WSW. at 6,510 meters above seal level over Knoxville, Tenn.

The mean monthly specific humidities and equivalent potential temperatures are shown in tables 2 and 3, respectively. There was a decrease in the average specific humidities of November as compared with those for October over all stations and at all levels; the greatest decrease (−3.4 grams) occurring over Kelly Field at 0.5 kilometers. The mean equivalent potential temperatures for November were lower than for October by amounts ranging between 8° A. and 17° A. at 0.5 kilometers and ranging between 3° A. and 9° A. at 5 kilometers. The lowest mean specific humidities and equivalent potential temperatures occurred over Fargo in the lower levels and over Sault Ste. Marie in the upper levels. The highest mean specific humidities occurred over San Diego up to 1.5 kilometers, over Kelly Field at 2 and 2.5 kilometers, over Oklahoma City at 3 and 4 kilometers, and over Barksdale Field at 5 kilometers. The highest mean equivalent potential temperatures occurred over San Diego up to 4 kilometers but with equal values over Kelly Field at 2.5 and 3 kilometers. The highest values at 5 kilometers occurred over Maxwell Field and Kelly Field.

The weather for the month was dominated largely by the anticyclonic Pp and Pc air masses which usually entered the country from western Canada. These air masses were unusually slow moving and generally followed a more southerly course than is normal for this month. The relatively slow eastward movement of these air masses retarded the movement of the moisture-laden cyclonic air masses from the Aleutian Island region, over the North Pacific Coast States, and was apparently responsible for the above normal precipitation which occurred over the latter region. The more southerly track followed by the cold anticyclonic air masses served also to deflect toward the east most of the warm Ta air masses which attempted to move northward from the Gulf of Mexico over the lower Mississippi Valley; resulting in excessive rainfall over the Gulf States and along the Atlantic coast. The deficiency of rainfall over the remainder of the country east of the Rocky Mountains was apparently due to the dominance of the relatively dry Pp and Pc air masses over these regions. The prevalence of the anticyclonic Pp and Pc air masses over most of the country during the greater portion of the month accounted also for the fact that the free-air temperatures were decidedly below normal at all levels up to 5 kilometers.

TABLE 1.—*Mean free-air temperatures (t), °C obtained by airplanes during November 1937. (Dep. represents departure from "normal" temperature)*

Stations	Number of obs.	Altitude (meters) m. s. l.															
		Surface		500		1,000		1,500		2,000		2,500		3,000		4,000		5,000	
		t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.	t	Dep.
Barksdale Field [1] (Shreveport), La. (52 m)	26	7.4	−0.9	8.5	−2.0	7.1	−2.5	5.9	−2.4	4.7	−2.0	2.7	−2.0	0.3	−2.3	−5.3	−2.7	−9.7	−1.8
Billing, Mont.[2] (1,000 m)	29	0.1	−0.2	.....	.....	.....	.....	2.4	−1.3	−0.1	−2.0	−3.5	−2.4	−6.6	−2.4	−13.5	−3.2	−19.9	−3.1
Boston, Mass.[2] (5 m)	25	4.0	+0.7	3.7	+1.5	1.9	+1.4	−0.2	+0.6	−2.3	0.0	−4.3	−0.2	−6.2	0.0	−11.6	−0.4	.....	.....
Cheyenne, Wyo.[2] (1,873 m)	30	−1.5	−0.1	.....	.....	.....	.....	.....	.....	0.4	−0.3	0.8	−0.5	−2.1	−0.6	−8.7	−0.9	−15.4	−1.0
Chicago, Ill.[2] (187 m)	30	0.3	−2.2	0.2	−2.3	−0.6	−2.5	−1.2	−2.0	−2.8	−2.4	−4.6	−2.3	−6.7	−2.1	−11.6	−2.0	−17.6	−2.4
Coco Solo, Canal Zone [3] (15 m)	19	24.4	.....	23.2	.....	20.6	.....	18.1	.....	15.6	.....	13.1	.....	10.3	.....	4.5	.....	−1.3	.....
El Paso, Tex.[2] (1,194 m)	30	7.8	+1.0	.....	.....	.....	.....	11.8	+1.5	9.7	+0.5	6.8	0.0	3.6	−0.6	−2.9	−1.3	−9.6	−1.5
Fargo, N. Dak.[2] (274 m)	30	−5.3	+0.1	−3.2	0.0	−3.1	−0.5	−3.0	−0.6	−3.9	−0.6	−5.5	−0.3	−7.8	−0.3	−13.8	−0.7	−20.3	−0.9
Kelly Field (San Antonio), Tex.[1] (206 m)	28	11.1	+0.2	12.3	−1.3	11.2	−1.7	10.5	−0.9	9.0	−0.7	7.0	−0.8	4.7	−0.8	−0.9	−0.4	−7.5	−0.1
Lakehurst, N. J.[2] (39 m)	24	1.9	−3.1	3.4	−2.1	1.6	−2.2	−0.1	−2.5	−2.4	−3.2	−5.1	−3.9	−7.8	−4.6	−13.5	−5.0	.....	.....
Maxwell Field (Montgomery), Ala.[1] (52 m)	9	10.7	.....	13.1	.....	11.2	.....	9.6	.....	7.9	.....	6.3	.....	3.6	.....	−2.5	.....	−6.7	.....
Mitchel Field (Hempstead, Long Island), N. Y.[1] (29 m)	28	3.7	−1.5	3.8	−1.4	1.7	−1.6	0.1	−1.5	−1.9	−1.9	−4.0	−2.2	−6.5	−2.7	−10.8	−1.5	.....	.....
Nashville, Tenn.[2] (180 m)	30	5.4	−0.7	6.6	−0.8	5.4	−1.1	4.1	−1.5	2.5	−1.7	0.2	−1.8	−2.0	−1.9	−7.3	−1.7	−12.8	−1.2
Norfolk, Va.[2] (10 m)	23	6.6	−2.1	7.5	−1.8	5.5	−1.6	4.3	−0.9	3.0	−0.3	1.1	−0.4	−1.0	−0.5	−6.5	−0.5	−11.7	+0.4
Oakland, Calif.[2] (2 m)	30	11.3	.....	12.1	.....	10.4	.....	8.9	.....	6.9	.....	4.7	.....	1.7	.....	−4.6	.....	−10.8	.....
Oklahoma City, Okla.[2] (391 m)	30	5.2	−1.0	7.3	−0.5	6.8	−1.8	5.8	−2.0	5.0	−1.1	2.8	−1.0	0.4	−1.0	−5.7	−1.4	−11.6	−1.0
Omaha, Nebr.[2] (300 m)	30	0.1	−1.0	0.9	−1.5	0.6	−2.7	0.2	−2.7	−0.9	−2.6	−2.9	−2.6	−4.8	−2.2	−10.7	−2.2	−17.3	−2.3
Pearl Harbor, T. H.[3] (6 m)	30	21.8	−1.0	21.4	+0.3	18.0	+0.6	15.6	+1.0	13.3	+0.6	11.5	+0.6	9.0	+0.5	4.0	+1.3	−2.2	+1.5
Pensacola, Fla.[3] (13 m)	22	9.2	−3.0	11.0	−2.4	10.1	−2.0	9.2	−1.3	7.5	−1.4	5.8	−1.0	3.5	−0.8	−1.8	−0.7	−7.5	−0.4
St. Thomas, Virgin Islands [2] (8 m)	30	28.0	.....	23.9	.....	20.7	.....	18.0	.....	15.3	.....	12.8	.....	10.3	.....	4.9	.....	−1.1	.....
Salt Lake City, Utah [2] (1,288 m)	30	3.7	.....	.....	.....	.....	.....	6.5	.....	4.3	.....	1.0	.....	−1.4	.....	−7.7	.....	−12.9	.....
San Diego, Calif.[3] (10 m)	28	11.9	−2.8	13.6	−2.4	14.2	−1.3	12.8	−0.5	11.0	+0.1	9.2	+0.8	6.3	+0.5	0.2	+0.8	−6.4	+1.1
Sault Ste. Marie, Mich.[2] (221 m)	28	−0.5	.....	−1.5	.....	−3.4	.....	−4.9	.....	−6.2	.....	−8.1	.....	−10.4	.....	−15.8	.....	−21.6	.....
Scott Field (Belleville), Ill.[1] (135 m)	21	0.8	−1.1	4.3	−0.2	3.5	−0.3	3.3	−0.3	1.6	−0.6	−1.1	−1.2	−3.8	−1.4	−9.0	−1.5	−17.2	−3.0
Seattle, Wash.[2] (10 m)	6	11.0	.....	9.7	.....	7.8	.....	5.4	.....	3.5	.....	0.8	.....	−2.2	.....	−9.1	.....	.....	.....
Selfridge Field (Mount Clemens), Mich.[1] (177 m)	28	1.2	−1.5	1.3	−2.2	−0.7	−2.6	−2.3	−2.9	−4.0	−3.4	−5.6	−3.1	−8.2	−3.4	−13.5	−3.5	−20.0	−4.0
Spokane, Wash.[2] (597 m)	30	4.2	+2.4	.....	.....	3.1	+0.2	1.3	−1.1	−0.9	−1.9	−3.8	−2.5	−7.3	−3.1	−14.2	−4.3	−20.8	−4.4
Washington, D. C.[2] (13 m)	27	3.9	−1.0	4.9	−0.2	3.5	−0.2	2.3	+0.3	0.1	−0.4	−2.1	−0.9	−4.5	−1.5	−10.4	−2.4	−16.2	−2.3
Wright Field (Dayton), Ohio [1] (244 m)	22	1.2	−0.6	2.4	−0.7	2.3	−0.3	1.8	+0.3	0.2	0.0	−1.3	+0.1	−3.5	+0.3	−9.3	0.0	−15.3	−0.2

[1] Army. [2] Weather Bureau. [3] Navy.

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii, where they are taken at dawn.

NOTE.—The departures are based on normals covering the following total number of observations made during the same month in previous years, including the current month (years of record are given in parentheses following the number of observations): Barksdale Field, 80 (3); Billings, 116 (4); Boston, 124 (5); Cheyenne, 119 (4); Chicago, 88 (3); El Paso, 90 (3); Fargo, 116 (4); Kelly Field, 104 (4); Lakehurst, 102 (4); Mitchel Field, 98 (4); Nashville, 117 (4); Norfolk, 125 (6); Oklahoma City, 116 (4); Omaha, 204 (7); Pearl Harbor, 139 (5); Pensacola, 159 (7); San Diego, 215 (9); Scott Field, 90 (4); Selfridge Field, 105 (4); Spokane, 115 (4); Washington, 155 (7); Wright Field, 90 (4).

TABLE 2.—*Mean free-air relative humidities (R. H.), in percent, and specific humidities (q), in grams/kilogram, obtained by airplanes during November 1937. (Dep. represents departure from "normal" relative humidity)*

Stations	Number of observations	Altitude (meters) m. s. l.																					
		Surface			500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.		q	R. H.	
			Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.		Mean	Dep.
Barksdale Field, La.	26	5.1	80	−2	4.6	63	−2	4.1	59	+1	3.7	54	0	3.5	52	+1	3.0	49	0	2.6	47	+1	1.9	46	+3	1.5	43	+3
Billings, Mont.	29	3.2	71	+4	.....	.....	.....	.....	.....	.....	3.2	58	+4	2.8	59	+6	2.5	64	+8	2.3	66	+8	1.6	68	+10	0.9	63	+7
Boston, Mass.	25	3.8	76	+2	3.7	72	+2	3.4	69	0	3.1	68	+4	2.7	66	+6	2.1	57	+3	1.8	53	+1	1.2	47	−2	.....	.....	.....
Cheyenne, Wyo.	30	3.0	69	+5	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.2	65	+5	3.2	57	+4	2.7	55	+3	1.7	52	+2	1.0	54	+4
Chicago, Ill.	30	3.0	77	−3	3.0	74	−1	2.8	68	0	2.6	60	−1	2.2	57	+2	2.0	54	+4	1.9	56	+6	1.2	49	+5	0.8	48	+5
Coco Solo, Canal Zone	19	18.4	96	....	16.9	90	....	15.1	89	....	13.4	87	....	11.9	85	....	10.3	82	....	8.6	79	....	6.7	79	....	4.9	79	....
El Paso, Tex.	30	4.0	54	−3	.....	.....	.....	.....	.....	.....	4.1	40	−4	3.6	38	−3	3.0	36	−4	2.5	36	−2	1.5	32	−3	0.9	28	−3
Fargo, N. Dak.	30	2.0	78	−4	2.4	77	−1	2.4	70	−1	2.3	64	+2	2.2	61	+5	2.0	58	+4	1.7	57	+4	1.2	56	+4	0.8	55	+3
Kelly Field, Tex.	28	6.6	80	−4	6.1	66	−2	5.8	63	0	4.9	53	−4	4.3	48	−4	3.6	43	−5	2.8	37	−3	1.8	32	−4	1.3	35	+4
Lakehurst, N. J.	24	3.6	82	−1	3.4	65	−9	2.9	60	−12	2.5	56	−11	2.2	54	−8	2.0	54	−3	1.7	53	+1	0.9	43	−3	.....	.....	.....
Maxwell Field, Ala.	9	6.6	82	....	5.8	59	....	5.3	59	....	5.0	57	....	3.8	46	....	2.6	32	....	2.0	29	....	1.1	22	....	0.9	22	....
Mitchel Field, N. Y.	28	3.9	79	−4	3.6	70	−5	3.2	68	−4	2.9	63	−5	2.7	64	+1	2.5	65	+8	2.1	61	+10	1.2	46	+1	.....	.....	.....
Nashville, Tenn.	29	4.5	79	−2	4.3	68	−3	4.2	68	0	3.5	58	0	3.2	55	+6	2.7	53	+7	2.2	47	+7	1.7	48	+9	1.0	41	+4
Norfolk, Va.	23	4.7	78	+2	4.3	64	−1	3.9	62	+1	3.5	58	−1	3.2	53	−2	2.8	50	+2	2.3	47	+5	1.6	45	+5	1.2	44	+8
Oakland, Calif.	30	7.2	87	....	6.9	74	....	5.9	66	....	4.9	58	....	3.8	50	....	3.0	43	....	2.4	41	....	1.7	41	....	1.0	40	....
Oklahoma City, Okla.	30	4.4	77	0	4.6	69	−1	4.5	66	+4	4.0	58	+2	3.7	53	+1	3.4	54	+4	3.1	56	+8	2.2	56	+12	1.4	49	+9
Omaha, Nebr.	30	2.9	74	−5	3.0	71	−2	2.9	65	+1	2.7	58	+2	2.5	55	+4	2.3	55	+7	2.1	54	+7	1.5	50	+4	0.8	47	+3
Pearl Harbor, Territory of Hawaii	30	13.2	81	+2	12.3	74	−2	11.2	78	−1	8.6	66	−8	6.7	56	−8	4.9	44	−6	3.6	36	−5	2.1	26	−5	1.2	22	−3
Pensacola, Fla.	22	6.5	91	+8	6.6	77	+5	5.7	66	+1	4.7	56	−3	3.7	46	−5	3.0	38	−8	2.4	35	−8	1.7	32	−5	1.0	30	−4
St. Thomas, Virgin Islands	30	18.4	78	....	17.8	91	....	14.7	86	....	12.2	80	....	9.7	72	....	7.8	63	....	6.4	58	....	4.4	52	....	3.0	47	....
Salt Lake City, Utah	30	4.0	71	....	.....	.....	.....	.....	.....	.....	4.2	60	....	3.6	56	....	3.2	59	....	2.9	60	....	2.0	58	....	1.3	53	....
San Diego, Calif.	28	7.8	91	+18	8.4	82	+24	6.8	60	+16	5.0	47	+10	3.8	37	+5	2.9	30	+1	2.3	26	−1	1.5	23	−2	0.9	25	0
Sault Ste. Marie, Mich.	28	3.1	83	....	2.9	83	....	2.7	79	....	2.5	78	....	2.1	71	....	1.9	65	....	1.5	60	....	1.1	63	....	0.7	59	....
Scott Field, Ill.	21	3.3	79	−2	3.0	57	−7	2.9	54	−6	2.6	46	−6	2.4	44	−4	2.0	43	−2	1.8	44	0	1.2	39	−4	0.8	41	−1
Seattle, Wash.	6	6.7	83	....	5.8	75	....	5.0	68	....	4.2	64	....	3.8	61	....	3.2	58	....	2.6	55	....	1.5	50	....	.....	.....	.....
Selfridge Field, Mich.	28	3.4	81	−1	3.3	76	+1	2.9	72	−1	2.6	67	−1	2.2	60	+2	1.9	56	+2	1.7	55	+3	1.1	51	+2	0.7	48	+3
Spokane, Wash.	30	4.8	86	0	.....	.....	.....	4.6	85	+7	3.9	79	+10	3.4	76	+10	2.9	75	+11	2.3	74	+11	1.4	69	+11	0.9	65	+9
Washington, D. C.	27	3.8	76	+3	3.4	60	−3	2.9	54	−6	2.6	49	−8	2.1	45	−8	1.8	41	−8	1.5	39	−2	1.1	40	+1	0.8	40	+3
Wright Field, Ohio	22	3.3	76	−5	3.3	69	−4	3.0	61	−4	2.7	54	−4	2.5	51	+1	2.3	50	+2	2.0	48	+2	1.4	46	0	0.9	42	−2

TABLE 3.—*Mean free-air barometric pressures (P), in mb, and equivalent potential temperatures (Θ_e), in °A, obtained by airplanes during November 1937*

Station	Number of Observations	Surface P	Surface Θ_e	500 P	500 Θ_e	1,000 P	1,000 Θ_e	1,500 P	1,500 Θ_e	2,000 P	2,000 Θ_e	2,500 P	2,500 Θ_e	3,000 P	3,000 Θ_e	4,000 P	4,000 Θ_e	5,000 P	5,000 Θ_e
		Altitude (meters) m. s. l.																	
Barksdale Field, La	26	1,016	293	961	297	905	300	851	304	801	307	752	309	707	310	628	312	553	317
Billings, Mont	29	892	291					847	298	796	300	747	301	702	302	612	304	539	305
Boston, Mass	25	1,017	286	956	291	899	293	845	295	794	297	744	299	699	301	614	305		
Cheyenne, Wyo	30	811	298							798	301	749	307	704	308	619	309	544	310
Chicago, Ill	30	996	282	958	285	900	289	845	293	794	295	745	299	699	301	613	305	538	308
Coco Solo, Canal Zone	19	1,008	348	954	349	901	346	850	344	802	343	756	341	712	339	630	339	558	337
El Paso, Tex	30	883	303					851	311	802	313	754	313	709	314	626	314	550	316
Fargo, N. Dak	30	983	274	956	280	897	285	842	290	790	294	742	298	696	300	610	303	534	306
Kelly Field, Tex	28	995	303	961	306	905	309	852	311	803	313	755	315	710	316	627	317	553	319
Lakehurst, N. J	24	1,015	284	958	290	900	291	846	293	795	296	746	297	699	300	614	302		
Maxwell Field, Ala	9	1,016	300	964	306	908	308	855	310	805	310	757	311	712	311	628	313	554	319
Mitchel Field, N. Y	28	1,016	286	958	290	900	292	846	295	795	298	746	300	700	302	615	306		
Nashville, Tenn	[1] 30	999	291	962	295	904	298	850	301	800	303	751	305	705	307	621	310	546	313
Norfolk, Va	23	1,021	291	962	296	906	298	851	301	800	304	747	307	707	308	622	311	548	315
Oakland, Calif	30	1,019	303	960	308	904	308	851	310	804	310	753	310	708	311	624	313	550	315
Oklahoma City, Okla	30	974	293	961	296	904	301	851	304	800	308	752	310	707	312	623	314	547	316
Omaha, Nebr	30	984	282	960	286	902	290	848	294	796	298	747	301	701	304	616	307	541	308
Pearl Harbor, Territory of Hawaii	30	1,016	330	960	333	905	332	853	328	805	325	757	323	714	322	632	323	558	324
Pensacola, Fla	22	1,022	298	964	306	907	308	854	309	804	310	756	312	710	313	627	316	553	318
St. Thomas, Virgin Islands	30	1,013	353	958	352	904	345	853	341	804	336	757	333	713	332	632	331	559	331
Salt Lake City, Utah	30	874	299					852	305	800	306	752	307	707	309	622	311	547	314
San Diego, Calif	28	1,017	304	959	313	904	315	851	314	802	315	755	315	710	316	628	318	554	318
Sault Ste. Marie, Mich	28	987	282	953	284	895	286	840	290	788	292	738	294	692	296	606	300	530	304
Scott Field, Ill	21	1,005	283	961	289	903	293	849	298	798	300	749	302	704	304	618	307	546	308
Seattle, Wash	6	1,019	301	960	302	904	304	849	304	798	306	749	307	704	308	619	308		
Selfridge Field, Mich	28	996	284	957	287	899	289	844	292	792	294	743	297	697	299	611	302	536	305
Spokane, Wash	30	946	295			901	297	847	299	796	301	746	302	701	301	614	302	538	305
Washington, D. C	27	1,021	285	962	291	905	293	850	297	799	298	750	300	704	302	618	306	544	309
Wright Field, Ohio	22	993	284	962	288	904	292	850	296	798	299	749	302	704	305	619	307	544	310

[1] Θ_e 29 observations.

TABLE 4.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during November 1937*

[Wind from N=360°, E=90°, etc.]

Altitude (m) m. s. l.	Albuquerque, N. Mex. (1,554 m) Direction	Albuquerque, N. Mex. (1,554 m) Velocity	Atlanta, Ga. (309 m) Direction	Atlanta, Ga. (309 m) Velocity	Billings, Mont. (1,088 m) Direction	Billings, Mont. (1,088 m) Velocity	Boston, Mass. (15 m) Direction	Boston, Mass. (15 m) Velocity	Cheyenne, Wyo. (1,873 m) Direction	Cheyenne, Wyo. (1,873 m) Velocity	Chicago, Ill. (192 m) Direction	Chicago, Ill. (192 m) Velocity	Cincinnati, Ohio (153 m) Direction	Cincinnati, Ohio (153 m) Velocity	Detroit, Mich. (204 m) Direction	Detroit, Mich. (204 m) Velocity	Fargo, N. Dak. (283 m) Direction	Fargo, N. Dak. (283 m) Velocity	Houston, Tex. (21 m) Direction	Houston, Tex. (21 m) Velocity	Key West, Fla. (11 m) Direction	Key West, Fla. (11 m) Velocity	Medford, Oreg. (410 m) Direction	Medford, Oreg. (410 m) Velocity	Nashville, Tenn. (194 m) Direction	Nashville, Tenn. (194 m) Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	357	1.9	338	2.0	256	3.3	268	2.5	270	3.8	253	2.9	249	1.0	250	3.8	289	1.5	35	1.9	32	3.1	105	0.2	275	0.7
500			357	2.2			288	8.2			261	7.1	248	4.1	262	7.6	295	3.1	121	2.0	56	6.4	153	0.8	212	1.0
1,000			318	2.4			291	7.7			269	9.5	255	8.1	267	9.1	285	6.0	212	1.8	76	4.6	163	2.6	259	3.9
1,500			284	3.7	260	6.6	292	9.7			266	9.7	263	8.8	274	8.4	285	6.7	290	3.8	80	3.2	208	4.7	266	5.2
2,000	300	2.9	283	4.7	282	7.0	272	12.1	269	5.5	281	9.1	277	9.0	273	9.3	282	10.2	289	4.6	37	1.4	233	6.2	277	5.4
2,500	296	4.3	278	5.9	283	7.4	269	14.0	281	10.4	284	9.3	279	8.9	308	7.7	288	13.3	294	6.9	18	1.6	252	7.0	299	7.1
3,000	292	7.0	264	6.3	279	8.8			287	10.1	281	5.9			303	7.1	292	13.7	290	8.4	256	3.2	267	4.2	309	5.0
4,000	292	10.1	267	6.6	287	9.2			296	10.1									289	9.1						
5,000	294	13.8																								

Altitude (m) m. s. l.	Newark, N. J. (14 m) Direction	Newark, N. J. (14 m) Velocity	Oakland, Calif. (8 m) Direction	Oakland, Calif. (8 m) Velocity	Oklahoma City Okla. (402 m) Direction	Oklahoma City Okla. (402 m) Velocity	Omaha, Nebr. (306 m) Direction	Omaha, Nebr. (306 m) Velocity	Pearl Harbor, Hawaii [1] (68 m) Direction	Pearl Harbor, Hawaii [1] (68 m) Velocity	Pensacola, Fla. [1] (24 m) Direction	Pensacola, Fla. [1] (24 m) Velocity	St. Louis, Mo. (170 m) Direction	St. Louis, Mo. (170 m) Velocity	Salt Lake City, Utah (1,294 m) Direction	Salt Lake City, Utah (1,294 m) Velocity	San Diego, Calif. (15 m) Direction	San Diego, Calif. (15 m) Velocity	Sault Ste. Marie, Mich. (193 m) Direction	Sault Ste. Marie, Mich. (193 m) Velocity	Seattle, Wash. (14 m) Direction	Seattle, Wash. (14 m) Velocity	Spokane, Wash. (603 m) Direction	Spokane, Wash. (603 m) Velocity	Washington, D. C. (10 m) Direction	Washington, D. C. (10 m) Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	263	2.3	145	1.5	88	1.2	308	1.2	43	3.5	13	3.3	272	1.4	145	2.9	35	0.8	270	1.2	141	1.3	183	1.7	312	1.4
500	289	7.9	207	0.9	149	1.9	268	3.4	71	5.8	81	4.9	267	4.3			337	1.9	275	2.9	184	5.1			290	6.8
1,000	290	9.0	280	1.8	222	3.8	271	8.4	75	6.0	104	2.0	278	7.1			334	1.9	271	3.9	194	6.1	204	2.8	285	7.8
1,500	283	9.4	263	2.2	268	4.3	275	9.1	87	5.2	83	0.4	271	6.4	163	4.4	316	1.2	272	4.8	204	7.5	214	2.6	276	8.3
2,000	289	11.8	270	3.3	275	4.3	275	9.7	82	4.2	356	2.7	261	6.4	196	4.5	294	2.8	278	6.5	195	4.1	228	6.2	271	8.3
2,500	292	2.2	282	4.4	292	7.1	288	10.4	90	2.0	326	0.9	273	6.3	243	4.1	293	4.6	308	5.1	200	4.7	227	7.5	271	9.1
3,000			289	5.9	281	3.6	289	9.4	45	1.8	295	3.6	268	7.3	267	7.1	279	7.1			175	4.4	275	3.5	277	12.1
4,000			299	6.2			286	13.7	306	1.8			317	6.0	251	9.1	281	6.5								
5,000									315	2.8																

[1] Navy stations.

TABLE 5.—*Maximum free-air wind velocities, meters per second, for different sections of the United States, based on pilot-balloon observations during November 1937*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m) m. s. l.	Date	Station
Northeast [1]	38.6	WSW	2,230	9	Kylertown	43.1	NW	4,990	6	Buffalo	44.4	NW	5,170	6	Buffalo.
East-Central [2]	38.0	WSW	720	14	Knoxville	41.2	SW	4,420	14	Washington	56.4	WSW	6,510	7	Knoxville.
Southeast [3]	30.2	W	2,200	14	Atlanta	40.0	W	4,420	20	Jacksonville	49.6	WSW	10,360	30	Jacksonville.
North-Central [4]	37.7	WNW	620	2	Detroit	33.2	WNW	3,430	5	Fargo	38.8	WSW	10,910	11	Detroit.
Central [5]	38.6	SW	2,260	25	Chicago	43.2	W	3,760	2	Indianapolis	48.8	WNW	8,510	3	Evansville.
South-Central [6]	30.6	NW	2,500	14	Memphis	38.0	NW	3,950	14	Memphis	42.5	W	11,250	5	Abilene.
Northwest [7]	36.8	SW	1,590	8	Spokane	45.0	NNW	4,900	26	Boise	39.0	NW	5,730	26	Spokane.
West-Central [8]	26.4	NW	2,040	28	Denver	50.2	SW	3,600	23	Reno	54.4	W	10,400	12	Modena.
Southwest [9]	34.1	WSW	1,380	8	Havre	40.8	WSW	4,080	11	Las Vegas	52.8	WNW	7,040	21	Albuquerque.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in charge]

By BENNETT SWENSON

Precipitation was deficient over most of the country during November. However, widely scattered regions received amounts considerably above the normal for the month. Thus, in a narrow belt along the Atlantic coast, in northeastern Texas and adjacent areas, and in the North and Central Pacific States, heavy precipitation occurred, the amounts being exceedingly heavy in portions of Oregon and northern California.

The excess precipitation along the Atlantic coast and over the Texas region resulted in light floods over portions of these areas. The crests of these rises are shown in the table below. No damage of any consequence occurred.

A series of storms occurred from about the 5th to the 27th of November over the North Pacific States, resulting in exceedingly heavy precipitation over the northern portion of the Sacramento Basin in northern California and over the Willamette Basin in Oregon and in adjacent regions.

The heaviest rainfall reported in the Sacramento Basin was 29.08 inches between the 10th and 24th at Kennett, Calif., and the greatest 24-hour amount at that place was 5.64 inches on the 20th. The stages in the Sacramento River from Red Bluff, Calif., to the mouth of the Feather River were not only by far the highest of record for November but equaled the high stages that usually occur only in midwinter and early spring. However, flood stage was exceeded only at Red Bluff, Calif., where the highest stage of 24.4 feet occurred on the 20th. The total loss resulting from the flooding is estimated at $97,000.

In the Willamette River Basin the greatest amount of precipitation recorded during November was 19.63 near Corvallis, Oreg. At Valsetz, Oreg., located a short distance west of the Coast Range Divide, a monthly total of 33.03 inches was measured. Of this 6.00 inches occurred on the 8th, preceded by 1.56 inches on the 7th, and followed by 1.41 inches on the 9th. There were 12 days with 1.00 inch or more of precipitation at this station.

Notwithstanding the excessive precipitation over the Willamette Basin, only three stations reported gage readings above flood stage, namely, Leaburg, Oreg., on the McKenzie; Jefferson, Oreg., on the Santiam; and Monroe, Oreg., on the Long Tom River. No damage was reported.

Estimates of losses that occurred in the flood in the Monongahela and Ohio Rivers during October, received too late for inclusion in the October REVIEW, are as follows: Monongahela River, $90,500, and Ohio River at Pittsburgh, Pa., $10,000.

CORRECTION TO JUNE REPORT

Page 248, table and chart showing precipitation in Pecos River Basin from May 23 to June 6, 1937:

Precipitation recorded for "Alamogordo Dam" occurred at Alamogordo, in Otero County, in southern New Mexico. No data are available for Alamogordo Dam. Table and chart should be corrected accordingly.

Table of flood stages in November 1937

[All dates in November unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE	*Feet*			*Feet*	
Tioughnioga: Whitney Point, N. Y.	12	12	13	13.1	12
James: Columbia, Va.	10	(1)	1	(2)	(2)
Roanoke: Williamston	10	(1)	9	(2)	(2)
		18	20	10.1	19
Santee:					
Rimini, S. C.	12	(1)	7	13.3	4, 5
		10	15	13.4	14
		17	21	13.2	19, 20
Ferguson, S. C.	12	(1)	8	(2)	(2)
		11	22	12.7	14, 15, 20, 21
MISSISSIPPI SYSTEM					
Arkansas Basin					
Petit Jean: Danville, Ark.	20	11	14	23.0	12
Red Basin					
Sulphur: Ringo Crossing, Tex.	20	10	13	22.8	10
		16	17	21.8	16
Naples, Tex.	22	18	24	23.7	22
PACIFIC SLOPE DRAINAGE					
Sacramento Basin					
Sacramento: Red Bluff, Calif.	23	20	21	24.4	20
Columbia Basin					
McKenzie: Leaburg, Oreg.	12	19	20	12.2	19
Santiam: Jefferson, Oreg.	10	20	20	10.6	20
		26	26	10.6	26
Long Tom: Monroe, Oreg.	10	22	26	12.8	25

[1] Continued from previous month.
[2] Crest occurred in October.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in Charge]

NORTH ATLANTIC OCEAN, NOVEMBER 1937

By H. C. HUNTER

Atmospheric pressure.—Striking features of the pressure averages were the deficiencies found nearly everywhere to the southward of 45° latitude, and the above-normal pressure to northward. The monthly departures of −0.25 inch at Horta and −0.10 inch at Turks Island were unusually large for those stations. Every Turks Island reading received was lower than the monthly normal; but at Horta, as at Madeira and Lisbon, the monthly range was decidedly large for the latitude. Horta readings were notably low during the period from the 7th to 17th.

The stations showing greatest excess of mean pressure were Lerwick, Shetland Islands (0.29 inch), and Julianehaab, Greenland (0.22 inch). Readings were lower than average during most of the first week at these stations, and at Lerwick also about the 17th to 22d. At nearly all other stations the lowest readings occurred during the period from the 11th to 18th.

The extremes of pressure among vessel reports at hand are 30.67 and 28.46 inches. The former reading was reported by an unidentified vessel about 200 miles east of Atlantic City, N. J., during the forenoon of the 24th. The low reading was noted on the British steamship *Dalcross*, near 53° north latitude, 47° west longitude, about 6 a. m. of the 1st.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, November 1937*

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.78	+0.22	30.32	21	29.02	1
Reykjavik, Iceland	29.79	+.17	30.48	9	28.85	3
Lerwick, Shetland Islands	29.99	+.29	30.45	28	29.50	20
Valencia, Ireland	29.96	+.07	30.42	12	29.06	17
Lisbon, Portugal	29.99	−.05	30.36	30	29.38	18
Madeira	29.93	−.08	30.27	30	29.50	17
Horta, Azores	29.88	−.25	30.34	4	29.28	14
Belle Isle, Newfoundland	29.88	+.11	30.52	28	29.14	11
Halifax, Nova Scotia	30.01	+.06	30.42	13	29.38	18
Nantucket	30.02	−.03	30.52	1	29.35	14
Hatteras	30.09	−.02	30.64	24	29.51	13
Bermuda	30.07	−.01	30.34	24	29.66	15
Turks Island	29.89	−.10	29.98	24	29.74	11
Key West	29.98	−.04	30.24	23	29.60	12
New Orleans	30.11	+.01	30.54	22	29.60	11

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—The number of gales reported was about as great as usual in November. One noteworthy feature of their distribution was the surprisingly large proportion of the gales from the 10th onward to the end of the month encountered in latitudes lower than 40°. Gales were more numerous and more noteworthy during the first week and from the 13th to the 23d than on the other days. No report of occurrence of force 12 has been received.

When the month began, a well-developed storm with particularly low pressure at its center was located to northeastward of Newfoundland; it traveled eastward, with center near the fifty-fifth parallel, for a time, then turned more to northeastward and was near Iceland on the 4th. During this period several strong to whole gales were reported from comparatively high latitudes.

A slow-moving LOW advanced eastward over the Gulf States about the 10th, and by the night of the 11–12th was central close to the coast of western Florida, with increasing energy; thence it moved northeastward near the coast line, the center being near Hatteras early on the 13th and to eastward of Cape Cod, with less strength, by the evening of the 14th. During the 13th and 14th two steamships reported force 11 winds from a southerly direction, while off the Carolina coast. These are the only advices at hand of force 11 in strictly Atlantic waters during November, but one instance in the Gulf of Mexico is noted below. The Greek freighter *Tzenny Chandris*, out from Morehead City, N. C., sank early on the 13th as a result of meeting this storm; 9 lives were lost of the crew of 29.

A LOW near the Azores on the 14th, with a marked trough extending from its center in a southwesterly direction, advanced east-northeastward to near the Bay of Biscay by the 17th and on the 19th was over the British Isles, with less energy than it had displayed on the preceding days. In connection with this storm some barometer readings unusually low for the area were noted in the Azores and Madeira Islands and in ports of southwestern Europe, and three vessels met winds of force 10.

To eastward of the Carolinas on the 19th and 20th, and somewhat farther to northeastward by the evening of the 21st, an energetic storm caused strong to whole gales. From the Norwegian steamship *Nidareid*, Captain Christopherson, an interesting account has been received of the vessel's traversing the "eye of the storm," about midday of the 21st, near 36°21′ N., 65°28′ W. The wind, which had been from the south, about force 9, "dropped to a dead calm at 11:30 a. m., the sky cleared and the sun shone brightly." At 1:30 the wind suddenly came from the west-northwest, rising quickly to force 7, but after an hour hauling to west and decreasing.

A northward-moving disturbance in the Gulf of Mexico, from the 23d to the 26th, is described in an accompanying article. The American motorship *Point Breeze*, bound from Atreco to New Haven, met force 11 wind from the northeast on the 24th, when more than 100 miles south-southwest of the mouth of the Mississippi River. Chart IX shows the situation on the 25th.

Fog.—There was comparatively little fog, even for November, a month when fog normally is rarely met. The region from the eastern coast of New England to the farthest limits of the Grand Banks had particularly little compared with what November usually brings.

Five different squares, rather widely scattered, had fog upon 3 days each. There is found no square where it occurred upon 4 or more days. Of these 5 one is near the United States coast from New Jersey to Hatteras; two are close to southern and eastern Newfoundland; one is to eastward of the Azores; and the fifth lies to northwestward of the Bay of Biscay.

The first 3 days of November saw some fog between the Azores and Ireland. In the Grand Banks-St. Lawrence-Nova Scotia area there was no fog before the 9th and practically none after the 18th. Near the American coast from Long Island to Georgia and in the Gulf of Mexico near Louisiana, nearly all the dates of occurrence were near the end of the month.

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OCEAN GALES AND STORMS, NOVEMBER 1937

Vessel	Voyage		Position at time of lowest barometer		Gale began November	Time of lowest barometer November—	Gale ended November—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Boston City, Br. S. S.	Quebec	Cardiff	53 30 N.	42 30 W.	[1] 30	3a, 1	2	28.69	SE.	SSW, 7	SSW.	SW, 9	S-SW.
Dalcross, Br. S. S.	Hartlepool	Botwood	53 21 N.	46 40 W.	1	6a, 1	3	28.46	W.	W, 9	S.	NW, 10	W-NW.
Memphis City, Am. S. S.	Cristobal	New York	24 42 N.	74 13 W.	1	1 p, 1	2	29.95	NE.	NNE, 9	NE.	NE, 10	None.
City of Norfolk, Am. S. S.	Havre	Norfolk	45 32 N.	42 49 W.	1	4 p, 1	2	29.50	W.	W, 7	NW.	NW, 9	
Beemsterdijk, Du. S. S.	Rotterdam	Boston	[2] 50 30 N.	31 59 W.	1	4 p, 2	3	28.98	SSW.	SW, 8	NW.	W, 9	SW-W.
West Tacook, Am. S. S.	Houston	Manchester	44 26 N.	44 35 W.	4	3 a, 5	5	29.52	SSW.	NNW, 10	N.	NNW, 10	SSW-NNW.
Exmoor, Am. S. S.	New York	Tangier	39 05 N.	47 40 W.	4	9 a, 5	7	29.81	S.	S, 10	ENE.	S, 10	S-NW.
Black Hawk, Am. S. S.	Rotterdam	New York	50 30 N.	34 51 W.	5	4 p, 5	5	29.47	S.	S, 8	NNW.	S, 9	SSE-S-NNW.
Black Falcon, Am. S. S.	New York	Rotterdam	47 14 N.	35 08 W.	4	4 p, 5	10	[2] 29.77	S.	S, 8	ENE.	NE, 10	S-NNW.
Normandie, Fr. S. S.	Southampton	New York	42 06 N.	56 12 W.	7	5 a, 7	7	29.31	SSE.	SW, 6	NW.	NW, 10	SSE-SW-NW.
Syros, Am. S. S.	New Orleans	London	41 05 N.	58 00 W.	6	5 a, 7	7	29.37	S.	W, 8	NNW.	NW, 9	S-NW.
Skramstad, Nor. M. S.	Iggesund	Newport News	41 33 N.	52 18 W.	7	Noon, 7	7	29.45	SSE.	SW, 9	NW.	SW, 9	SW-NW.
Jean Jadot, Belg. S. S.	Antwerp	New York	44 40 N.	45 00 W.	7	8 p, 7	8	29.60	SSE.	SSE, 8	NNW.	SSE, 10	SSE-SW.
Yselhaven, Du. S. S.	do	Montreal	49 40 N.	40 28 W.	7	5 p, 8	9	29.79	SSW.	S, 10	N.	S, 10	S-NNW-N.
Washington, Am. S. S.	Cobh	New York	47 30 N.	41 12 W.	8	10 p, 8	9	29.93	S.	NNW, 9	NW.	NNW, 9	S-NNW.
Borinquen, Am. S. S.	New York	San Juan	[2] 30 48 N.	70 24 W.	11	7 a, 13	13	29.66	ENE.	S, 9	S.	SSE, 9	SE-SSW-S.
San Lucas, Am. S. S.	Cristobal	Baltimore	[2] 33 44 N.	75 19 W.	11	Noon, 13	13	29.56	ESE.	W	W.	S, 11	ESE-S-W.
Solana, Am. S. S.	Houston	New York	[2] 36 37 N.	74 45 W.	11	1 p, 13	13	29.47	ESE.	W, 3	SSE.	SSE, 10	SSE-W.
Phobos, Du. M. S.	Montreal	Texas City	[2] 36 49 N.	69 06 W.	13	1 a, 14	14	29.51	ESE.	S, 9	SW.	SSE, 11	SSE-WSW.
Nemaha, Am. S. S.	Kiel	New Orleans	44 47 N.	20 58 W.	15	5 a, 16	15	29.00	SE.	SSW, 4	SE.	SE, 9	SE-SW.
Liberator, Am. S. S.	Hull	do	41 27 N.	28 30 W.	16	8 a, 16	[1] 16	29.15	W.	W, 9	W.	W, 10	
Penrith Castle, Br. M. S.	Dakar	New York	23 57 N.	37 23 W.	16	6 p, 16	16	29.77	SW.	SW, 8	WNW.	SW, 9	SW-WNW.
Independence Hall, Am. S. S.	Havre	do	50 08 N.	9 45 W.	17	4 a, 17	19	28.97	SSE.	SSE, 7	N.	NNW, 9	SSE-SSW.
Exchange, Am. S. S.	Gibraltar	do	35 30 N.	21 12 W.	17	10 p, 17	18	29.16	S.	WNW, 9	NW.	WNW, 10	SSW-NW.
Birmingham City, Am. S. S.	do	Savannah	35 30 N.	16 03 W.	17	4 a, 18	18	29.34	S.	SW, 10	NW.	WSW, 10	S-WSW.
Mahsud, Br. S. S.	do	London	38 10 N.	9 30 W.	18	4 p, 18	18	29.33	S.	WSW, 8	NW.	W, 8	S-WNW.
Swiftsure, Am. S. S.	Boston	Baytown, Tex.	33 53 N.	72 57 W.	19	11 p, 19	20	29.69	SSE.	SSE, 7	NW.	SSE, 9	SSE-NW.
S. B. Hunt, Am. S. S.	do	Aruba	35 30 N.	68 45 W.	19	3 p, 20	20	29.57	S.	S, 8	W.	S, 9	S-W.
Normandie, Fr. S. S.	Havre	New York	41 38 N.	59 10 W.	21	3 p, 21	21	29.75	SE.	SSE, 10	ENE.	SSE, 10	SSE-ENE.
Sinaloa, Hond. S. S.	Bluefields	New Orleans	14 24 N.	83 06 W.	22	6 a, 22	22	29.92		NNW, 6		NNW, 6	
Cananova, Nic. S. S.	New Orleans	Puerto Mexico	20 30 N.	93 12 W.	23	6 a, 24	24	30.11		NW, 7		NW, 8	
Texas, Am. S. S.	Port Arthur	Wilmington, N. C.	27 20 N.	90 12 W.	24	4 a, 25	25	29.85	NNE.	NNE, 7	NNE.	NNE, 8	
Swiftsure, Am. S. S.	Boston	Baytown, Tex.	27 21 N.	89 33 W.	24	6 a, 25	24	29.87	NE.	Var. 3	ENE.	ENE, 9	SSW-WSW.
Exminster, Am. S. S.	Gibraltar	New York	36 10 N.	32 59 W.	26	11 a, 26	26	29.43	S.	SW, 7	W.	SSW, 9	
Boston City, Br. S. S.	Bristol	Philadelphia	46 30 N.	44 00 W.	26	4 a, 27	28	29.31	N.	N, 9	N.	N, 10	
Excambion, Am. S. S.	New York	Gibraltar	39 22 N.	39 10 W.	27	1 a, 28	28	29.16	WNW.	W, 8	W.	W, 9	
NORTH PACIFIC OCEAN													
San Lucas, Am. S. S.	Los Angeles	Balboa	[2] 13 27 N.	94 04 W.	[1] 31	4p, 1	1	29.92	NE.		NW.	N, 8	8 points.
Getsuyo Maru, Jap. M. S.	Dairen	Los Angeles	46 19 N.	148 05 W.	1	2a, 1	1	29.37		NNW, 10		NNW, 10	
Empress of Japan, Br. S. S.	Victoria, B. C.	Honolulu	41 34 N.	136 33 W.	[1] 31	6a, 1	1	29.61	SE.	SW, 8	WNW.	W, 10	SW-WSW.
President Jefferson, Am. S. S.	Yokohama	Victoria, B. C.	50 12 N.	135 40 W.	1	2p, 1	2	29.22	ESE.	SE, 7	S.	SE, 10	ESE-SE.
President Jackson, Am. S. S.	Victoria, B. C.	Yokohama	45 51 N.	159 00 E.	2	4p, 2	3	29.60	SSE.	S, 10	WNW.	S, 10	SE-SW.
Tai Ping, Nor. M. S.	Yokohama	Los Angeles	39 35 N.	172 30 E.	5	4p, 5	7	29.72	N.	NNE, 8	E.	NNE, 9	N-NE.
Tsuyama Maru, Jap. S. S.	Otaru	do	45 45 N.	146 43 E.	7	10p, 7	8	29.63		NNW, 10		NNW, 10	
Tweedbank, Br. M. S.	San Francisco	Manila	26 37 N.	179 47 W.	7	3p, 7	7	29.82	S.	S, 10	W.	SSW, 12	SSE-SSW.
President McKinley, Am. S. S.	Yokohama	Victoria, B. C.	49 36 N.	137 24 W.	7	3p, 8	7	29.47	W.	WSW, 5	WNW.	W, 8	W-SW.
Chickasaw City, Am. S. S.	Los Angeles	Yokohama	33 30 N.	179 12 E.	9	5a, 9	9	29.58	S.	S, 8	W.	SSW, 9	S-SW.
President Harrison, Am. S. S.	Honolulu	Kobe	33 55 N.	146 13 E.	9	6a, 10	10	29.69	SW.	SSW, 9	WNW.	SW, 9	SSW-SW.
Talthybius, Br. S. S.	Yokohama	Victoria, B. C.	46 06 N.	165 17 E.	11	4p, 11	12	28.94	NNE.	Var. 2	NNW.	NNW, 8	ESE-Var-NNE.
Michigan, Am. S. S.	Cebu	San Francisco	38 15 N.	165 45 E.	10	6p, 11	12	29.65	S.	WSW, 9	N.	WSW, 10	SW-W.
Kwanto Maru, Jap. M. S.	Yokohama	Los Angeles	45 23 N.	172 00 E.	16	4p, 17	18	29.72	SE.	ESE, 8	ESE.	ESE, 8	
President Jefferson, Am. S. S.	Victoria, B. C.	Yokohama	49 07 N.	168 52 E.	17	Noon, 18	18	29.41	SE.	NW, 6	NW.	SE, 9	SE-NW.
Do	do	do	45 00 N.	156 00 E.	19	10a, 20	20	28.87	ESE.	W, 8	NW.	E, 10	SSW-NW.
Empress of Asia, Br. S. S.	do	do	48 34 N.	166 52 E.	20	10p, 20	21	28.95	SSE.	S, 10	W.	S, 10	SE-SW.
Kwanto Maru, Jap. M. S.	Yokohama	Los Angeles	44 18 N.	147 47 W.	21	Mdt, 21	22	29.47	NNW.	WNW, 8	WNW.	NW, 8	
Empress of Asia, Br. S. S.	Victoria, B. C.	Yokohama	44 00 N.	153 30 E.	22	2p, 22	22	29.50	SE.	SSE, 8	NW.	SSE, 8	SSE-SW.
President Coolidge, Am. S. S.	Yokohama	Honolulu	34 58 N.	148 06 E.	22	4p, 22	22	29.45	S.	S, 8	NW.	S, 8	
Nagara Maru, Jap. M. S.	do	Los Angeles	46 15 N.	179 15W.	22	Mdt, 22	23	[3] 29.13	NE.	ENE, 8		ENE, 8	
President Polk, Am. S. S.	Honolulu	Yokohama	30 54 N.	165 12 E.	24	11a, 23	24	29.72		W, 7		NW, 8	S-W.
Neches, U. S. S.	Los Angeles	Balboa	15 48 N.	95 18 W.	24	3p, 24	24	29.86	NE.	NNE, 7	WNW.	N, 9	NE-N.
San Pedro Maru, Jap. M. S.	Yokohama	San Francisco	39 03 N.	174 12 E.	22	Noon, 24	25	29.19	ENE.	W, 8	NW.	NE, 10	W-NW.
Lahaina, Am. S. S.	Los Angeles	Balboa	15 07 N.	95 03 W.	24	5a, 25	25	29.89	NE.	NNE, 8	N.	NNE, 8	

[1] October.
[2] Position approximate.
[3] Barometer uncorrected.

NORTH PACIFIC OCEAN, NOVEMBER 1937

By WILLIS E. HURD

Atmospheric pressure.—Atmospheric pressure over the extreme northern part of the ocean for November 1937 was low, with average center of the LOWS, east of the Peninsula of Alaska (Kodiak 29.62 inches). Owing to several days with high barometer readings over the central Aleutians, the average pressures at Dutch Harbor and St. Paul were 0.13 and 0.15 inch above the normal. At the stations given in table 1, the pressure extremes in the Aleutian LOW region were 30.58 on the 16th and 28.76 on the 9th, both at St. Paul. At Kodiak and Juneau the lowest readings occurred on the 22d and 24th. The lowest reported barometer of the month in the North Pacific area was 28.68, at Queen Charlotte Island on the 24th.

Owing to the prevalence of LOWS in high latitude and their considerable southward extension, high pressure this month is shown as an anticyclonic band stretching from the California coast across the Hawaiian Islands and thence westward to the east China coast. Along this belt, Midway Island, with an average of 30.00, had a departure of −.08; while Naha, in the Nansei Islands, with an average of 30.02, had a departure of +.12, thus indicating the unusual strength of the Asiatic anticyclone in east China waters.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, November 1937, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	29.95	−0.05	30.66	20	29.24	10
Dutch Harbor	29.72	+.13	30.34	15, 16	29.06	9
St. Paul	29.74	+.15	30.58	16	28.76	9
Kodiak	29.62	+.06	30.12	13, 14	28.94	22
Juneau	29.78	+.02	30.20	9	28.90	24
Tatoosh Island	29.88	−.09	30.38	3	29.40	8
San Francisco	30.07	−.02	30.26	25	29.82	11
Mazatlan	29.91	+.02	29.96	(18, 19, 22.)	29.82	16
Honolulu	30.04	+.02	30.14	7	29.87	16
Midway Island	30.00	−.08	30.18	25	29.66	17
Guam	29.85	−.01	29.89	2, 24	29.74	30
Manila	29.83	.00	29.93	29	29.56	17
Hong Kong	30.00	−.04	30.18	24, 25	29.76	18
Naha	30.02	+.12	30.18	24	29.80	18
Titijima	30.00	+.02	30.15	24, 26	29.62	18

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

Extratropical cyclones and gales.—Notwithstanding the advance in the season, the North Pacific cyclones of November were much shallower as a rule than those of the preceding month, and on only a few days did their central pressures fall below 29 inches. Except in middle latitudes of the ocean there was little or no increase in storminess over that of October. The weather was only moderately severe along the higher and middle steamship routes, and only 8 days were reported with gales of force as high as 10. The highest wind reported by a vessel was of force 12, encountered on the 7th by the British motorship *Tweedbank* a short distance southwest of Midway Island. The accompanying lowest pressure was 29.82.

November 1 and 2 were stormy days in both northwestern and northeastern waters. A cyclone east of northern Japan caused gales of force 8 to 10 over the northern route to the southeastward of the Kuril Islands on both dates, then moved northward over Kamchatka and thence eastward into the Bering Sea. In the northeastern sector storminess was equally heavy, but more widespread, with gales of force 8 to 10 reported from nearly all parts of the region within latitudes 40° and 50° N., longitudes 125° and 150° W. Lowest pressures there were about 29.20 inches.

During the period of the 5th to 12th stormy weather occurred north and northwest of Midway Island, between latitudes 30° and 40° N., in addition to the hurricane winds already mentioned as encountered southwest of Midway on the 7th. Most of the high winds were of force 8–9, but force 10 gales occurred on the 11–12th near 38° N., 166° E.

From the 8th to the 25th cyclonic weather overspread much of the northern part of the ocean, with scattered developments of LOW centers which were accompanied, along the western half of the northern routes, particularly on the 18th to 24th, by fresh to whole gales. Over the eastern half of the routes gales were fewer and less severe. However, the Weather Bureau station at North Head, Wash., had maximum wind velocities of 49 miles an hour from the south on the 13th, 22d, and 23d, and a 72-mile wind (force 11) on the 24th.

Typhoons.—Two disastrous typhoons crossed the Philippine Islands in November, one during the 11th, the other during the 17th. Both caused considerable loss to life and property. The history of these storms is given in the subjoined report prepared by the Rev. Bernard F. Doucette, S. J., of the Philippine Weather Bureau.

Tehuantepecers.—In the Mexican Gulf of Tehuantepec, norther-type gales of force 8 were reported on the 1st and 25th, and of force 9 on the 24th. During the Tehuantepecers of the 24th, the U. S. S. *Neches* reported a considerable drop in the air and water temperatures. The British motorship *Adellen*, in describing the weather features that day in the Gulf, spoke of a "slight haze and a hard bright glare on the horizon," with a cloudless sky except for a fan-shaped formation of cirrocumulus radiating from a northerly point at noon.

Fog.—Fog was observed on the 2d near 45° N., 160° E., and on the 5th to 8th and the 27th along the 40th parallel between 180° and 160° W. It occurred in California coastal waters on 7 days; west of Lower California on 2 days; and in the Gulf of Tehuantepec on 2 days.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, OCTOBER 1937

Rev. BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon, September 30–October 6, 1937.—Over the Pacific, about 350 miles east of Samar, a depression formed during the forenoon hours of September 30 and then moved northwest from this position. Two days later, it inclined to the west-northwest and crossed the Balintang Channel. On October 2 it intensified as it approached Calayan, passing close to and south of this station. The course of this storm hardly changed as it moved across the northern part of the China Sea up to the locality of Pratas Island, where it inclined to the north-northwest (October 4). The morning of October 5 the typhoon was entering the continent between Hong Kong and Swatow, disappearing the next day.

At Calayan, October 2, at 5 p. m., the minimum pressure was recorded, namely 737.95 mm (29.053 inches, corrected for gravity). North-northeast winds of force 7 were blowing at the time. The strongest wind experienced at that station during the course of the storm was force 10, from the east, at 9 p. m. of the same day.

On October 4, the two ships, *President Wilson* and *President Jefferson*, had severe typhoon weather as both

ships delayed their progress toward Hong Kong, being within 150 miles distance from the typhoon center. The S. S. *President Wilson* experienced west-southwesterly winds force 8 and a sea from the same direction, with a northerly swell, as she slowly proceeded from Manila to Hong Kong. A value of 29.54 inches for the pressure was reported. The S. S. *President Jefferson*, on the opposite side of the typhoon center, proceeding from northern Chinese ports to Hong Kong, had pressures around 29.64 inches with easterly winds, force 10 to 8.

No notice of serious damage in the Philippines due to this typhoon has come to the attention of the Observatory staff.

Typhoon October 9–20, 1937.—On October 9 there was a trough of low pressure extending from the Philippines to the Mariana Islands. Over the eastern portion, a depression appeared about 180 miles north of Yap and moved west by north to the 130th meridian, where it intensified sufficiently to be called a typhoon. Its further course was such that central and northern Luzon were threatened, for during October 12 to 14 it had inclined to the west-north west. Observations during the night of October 14 and early morning hours of the 15th from Tuguegarao and Echague indicated that the storm had decreased in intensity and was crossing the island, but the more complete synoptic observations of October 15 showed that the typhoon was still over the Pacific, located about 120 miles east of northern Luzon and, fortunately, during the day, inclining northward. When the typhoon had reached the eastern part of the Bashi Channel its course changed to the northeast, and when about 120 miles southeast of Naha it shifted to the east (October 17). A northeasterly direction was again followed, the change occurring during the afternoon of October 18, the storm passing about 150 miles northwest of the Bonins on its way beyond the region of observation.

The S. S. *President Hoover* passed west of this typhoon center when it was located southeast of the Nansei (Loochoo) Islands. Of the observations sent to the Observatory, the following best represents the force and energy of this severe storm. At 0400 G. C. T. (noon, 120th meridian time) October 17, the weather experienced at latitude 23.9 N. 127.7 E. was "torrential rain, high seas, and heavy swell, N.–12, barometer 29.07 in."

Newspapers of October 15 had reports of three deaths and considerable property damage over Luzon due to the typhoon weather. Over the Visayan Islands heavy rains were associated with a strong persistent southwesterly current.

Typhoon, October 10–12, 1937.—Over the western part of the trough of low pressure mentioned at the beginning of the preceding typhoon report, a depression appeared about 150 miles east of central Samar, moved west-northwest to southern Luzon, became stationary, and disappeared over Lagonoy Gulf. This storm had the characteristics of being a secondary disturbance, the primary being the typhoon of October 9–20. There was definite circulation around a center, with low barometers, but weak winds. At the same time, the southwesterly winds over the Visayan Islands were increasing in strength, until there was no more evidence of circulation over Lagonoy Gulf, this happening as the primary disturbance intensified. Because of the low values of the barometers (lower than 750 mm, 29.528 inches) this disturbance is classified as a typhoon.

Typhoon October 19–21, 1937.—The observations from the S. S. *Swartenhoudt* on the afternoon of October 19 showed the presence of a small active center about 180 miles east of Quinhon, Indo China. This typhoon moved a short distance west-northwest and then inclined somewhat to the west-by-south, bringing it to the coast between Quinhon and Nhatrang. On the 21st, only slight traces of its existence were evident. The M. S. *Bengalen* passed about 200 miles south of the storm and reported a high choppy northerly swell.

The S. S. *Swartenhoudt* reported October 19, 5 p. m. (120th meridian time), from latitude 12.30 N., longitude 112.20 E. a barometer of 752 mm (29.606 inches) west winds, force 12, heavy rain, very high confused swell.

Depression, October 15–25, 1937.—A low pressure area formed about 300 miles south of Guam, moved in a northwesterly direction, then west-northwesterly to the regions near latitude 16 N., longitude 132 E., where it recurved to the northeast and disappeared. It gave no evidence of being intense.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, NOVEMBER 1937

Rev. BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon, November 8–13, 1937.—An extensive low pressure area over the western Caroline Islands finally, on November 8, manifested a definite center which moved in a northwesterly direction from a position about 120 miles west of Yap. On November 10 this disturbance was located about 300 miles east of San Bernardino Strait. During the forenoon, it moved a short distance to the northwest, but changed to a west-by-north course when it reached the 14th parallel of latitude, intensifying as it proceeded. At 6 a. m. November 11 it was central about 50 miles northeast of the Camarines Provinces, continuing its west-by-north motion. It crossed Pollilo Island, then passed close to and north of Infanta, Tayabas Province, likewise Manila, after which it deflected its course slightly to west-by-south, thus passing close to and south of Olongapo, Zambales Province. In the China Sea, November 12, it continued, it is supposed, this west-by-south course, inclining to the west-southwest and perhaps southwest as it approached Indo China. The morning of November 14 showed that it had practically disappeared a short distance inland, after passing between Quinhon and Nhatrang.

Barometric minima [1] along the course of the typhoon are as follows: Infanta, Tayabas, had a value of 721.14 mm (28.392 inches) at 2:40 p. m., November 11, as the typhoon center passed close to and north of the station. Hurricane winds prevailed as the typhoon passed with northwest winds backing to south. North of Manila, as the typhoon center passed between 4 and 5 p. m., values close to 740 mm (29.134 inches) were observed on recently compared aneroid barometers in private houses, thus giving dependable values. At the observatory, south of the typhoon path, the minimum of 745.40 mm (29.346 inches) was recorded at 4:35 p. m. The Friez anemometer ceased recording soon after 4 p. m. From a Beckley anemograph, the 1-hour average (the highest during the afternoon) between 4 and 5 p. m., was 64 m. p. h., from the southwest. There were many gusts of greater velocity, estimated close to 80 m. p. h. during the period from 4 to 5:30 p. m. The passage of the storm over the hilly country between Infanta and Manila had weakened the typhoon very much. In the China Sea, it did not exert its influence to any great extent and only the observation received from the S. S. *Hong Kheng*, November 13, 6 a. m., in latitude 14°12′ N., longitude 110°36′ E., indicated the existence of the disturbance approaching Indo China;

[1] Values of barometric minima are corrected for gravity.

since, in that position, the winds were force 9 from the northeast and the pressure was 999 millibars.

A total of 38 deaths was reported in the Manila newspapers of November 16. Property loss, mostly damaged houses, mounted above $50,000.

Typhoon, November 15–23, 1937.—A well-developed depression manifested itself about 300 miles southeast of Yap on the morning weather map, November 15. It is possible that this disturbance originated over the eastern Caroline Islands, but no data are available at present for confirmation of this statement. The depression moved steadily and rapidly along a west-northwest course, which caused it to approach the northern part of Surigao Strait during the morning hours of November 17. It was intense enough the day before to be called a typhoon. Crossing the central part of Leyte, that is, passing close to and south of Ormoc, its course led it over the northern part of Cebu Island, and afterward over the northern part of Panay Island, the center passing close to and south of Capiz. It probably deflected its course slightly at this locality, but further information is necessary for certainty. A few hours later, it passed close to the southern coast line of Mindoro Island on its way into the China Sea. It had been proceeding along a west-northwest course from the Pacific Ocean to the China Sea, which course was changed to the north when it reached the regions between longitudes 118° and 119°. It was not until November 20 before this threat to the western coast of Luzon shifted its direction to the northwest. When about 150 miles south of Pratas, it began to recurve to the northeast, and an inclination to the east-northeast on November 22 caused the typhoon, now much weakened, to cross the Bashi Channel and move into the Pacific Ocean where, following an east-northeast and east direction, it disappeared over 600 miles east of Formosa.

Of all the barometric minima reported along the course, only those less than 740 mm (29.134 inches) will be given. At all of these stations, hurricane winds were experienced. Guiuan, Samar Province, reported 730.21 mm (28.748 inches) at 6 a. m. November 17, the typhoon passing close to and south of the station. At the nearby town of Homouhon a calm lasting 15 minutes was experienced. Tacloban, Leyte Province, had a minimum pressure of 737.82 mm (29.048 inches) at 8:30 a. m. November 17. Ormoc, Leyte, had 718.96 mm (28.305 inches) at 10 a. m. Capiz, Capiz Province, experienced 724.98 mm (28.542 inches) at 5:45 p. m. of the same day. Many stations within a distance of 80 miles from the course had minimum values between 740 and 750 mm (29.134 and 29.528 inches). When the typhoon was in the China Sea and moving along its northerly course, many ships sent observations, which were of great assistance in locating the center. Of these, the most significant observations for indicating the intensity of the storm were those made on board the S. S. *Empress of Japan*, which, en route to Manila along a southerly course, passed close to and west of the typhoon center. At midnight, November 19–20, a pressure of 721.8 mm (28.417 inches) was had, with north-by-west winds force 11–12 near lat. 16°24′ N., long. 118°36′ E. The ship's barograph registered a minimum value of 28.08 in., uncorrected.

The Manila newspapers, published on November 23, gave the total of deaths due to this typhoon as 231, with the added qualification that all districts had not been heard from. It is quite certain that this number does not represent all the lives lost, but it is very difficult to give an estimate of those not reported. The property loss undoubtedly is in the millions of pesos. These losses, both to life and property, were distributed all along the path of the typhoon, no district being favored by any weakening of the storm, which was one of the worst typhoons to visit the Visayan Islands during recent years.

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—*Condensed climatological summary of temperature and precipitation by sections, November 1937*

[For description of tables and charts, see REVIEW, January, p. 29]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	51.5	−2.9	Camp Hill	85	1	Tuscumbia	12	21	3.19	−.22	Newton	7.68	Fort Payne	1.03
Arizona	52.2	+1.5	Florence	95	3	Springerville	10	27	.08	−.95	Childs	.96	35 stations	.00
Arkansas	48.3	−3.1	Dumas	90	1	Lead Hill	6	21	4.99	+1.27	Warren	9.44	Gravette	1.54
California	52.6	+.3	Indio	95	3	Twin Lakes	3	18	3.61	+1.17	Kennett	29.12	30 stations	.00
Colorado	36.5	+1.3	Trinidad	82	14	Dillon	−18	27	.64	−.14	Steamboat Springs	3.38	2 stations	.00
Florida	62.4	−2.8	3 stations	89	[1]1	Mason	21	21	4.35	+2.13	Okeechobee	8.27	Miami	.33
Georgia	51.0	−3.5	Fargo	86	2	Blairsville	3	22	2.03	−.61	Blakely	7.59	Canton	.66
Idaho	38.1	+2.6	Challis	75	1	2 stations	−4	[1]28	3.05	+.98	Deception Creek	14.02	Challis	T
Illinois	38.9	−2.5	3 stations	84	1	do	0	[1]21	1.48	−1.25	McLeansboro	2.78	Sycamore	.42
Indiana	39.2	−3.1	Shoals	86	1	do	−2	23	1.78	−1.28	Howe	3.49	Martinsville	.73
Iowa	33.9	−2.3	Stockport	82	1	Sibley	−17	21	.72	−.87	Keokuk	1.92	Marathon	.12
Kansas	41.0	−2.2	Sedan	87	1	Horton	−2	28	.67	−.60	La Cygne	2.11	2 stations	T
Kentucky	43.2	−3.2	Princeton	82	1	Farmers	6	23	1.63	−1.80	Glasgow	3.77	Greenup	.74
Louisiana	55.3	−3.6	Calhoun	88	1	Tallulah	18	21	2.77	−1.06	Shreveport	7.41	New Orleans (Shushan).	.95
Maryland-Delaware	44.4	−.8	2 stations	79	8	Oakland, Md	−3	24	3.45	+.99	Ferry Landing, Md	5.66	2 stations	.95
Michigan	35.6	−1.4	South Haven	72	1	Iron Mountain	−9	29	2.41	−.07	Dukes	4.75	Alpena Forest	.73
Minnesota	28.3	−1.2	Windom	75	9	Windom	−16	21	.65	−.50	Pigeon River Bridge	3.43	Fairmont	.06
Mississippi	52.3	−2.8	Crystal Springs	88	1	5 stations	16	21	3.91	+.29	Louisville	7.17	Rolling Fork	.59
Missouri	41.0	−3.3	Mountain Grove	90	1	Grant City	−7	21	1.85	−.79	Bragg City	3.19	Tarkio	.62
Montana	32.1	.0	Columbus	72	11	2 stations	−13	[1]18	.73	−.23	Heron	7.06	Lustre (near)	T
Nebraska	35.9	−1.3	Culbertson	79	5	do	−14	[1]20	.21	−.55	Falls City	1.54	Howells	.00
Nevada	43.9	+4.0	Logandale	87	[1]3	Yerington	10	30	.84	+.20	Lewers Ranch	4.09	4 stations	.00
New England	38.9	+.9	Waterbury, Conn	70	10	Chelsea, Vt	−2	23	5.20	+1.73	Southbridge, Mass	9.51	Newport, Vt	1.22
New Jersey	43.7	+.1	3 stations	72	[1]8	Runyon	10	24	4.57	+1.39	Charlotteburg	6.65	Sussex	2.58
New Mexico	42.8	+.3	Hagerman	88	1	2 stations	−3	[1]26	.12	−.54	2 stations	.50	81 stations	.00
New York	38.8	+.8	Dansville	72	8	Indian Lake	1	23	3.21	+.20	Bonaparte	5.91	Canaadea Dam	1.89
North Carolina	47.3	−2.6	Kinston	81	[1]2	Mount Mitchell	−6	21	2.98	+.35	Newbern	8.59	Marshall	.45
North Dakota	25.2	−1.4	Gackle	73	10	Willow City	−25	20	.41	−.19	Hansboro	1.50	Zap	T
Ohio	39.4	−2.0	2 stations	73	[1]1	4 stations	7	[1]21	1.30	−1.42	Miamisburg	2.62	Vickery	.65
Oklahoma	46.8	−3.0	Coalgate	95	1	Boise City	5	19	1.59	−.42	Hugo	6.59	Arnett	T
Oregon	43.4	+2.9	Powers	75	6	Fremont	6	30	6.30	+2.58	Valsetz	33.03	Lake	.83
Pennsylvania	40.7	−.6	Mifflintown	79	8	Somerset	−3	24	2.56	−.31	Newport	5.25	Greensboro	.78
South Carolina	50.4	−3.4	3 stations	82	[1]2	2 stations	10	[1]21	2.56	+.23	Georgetown	4.97	Calhoun Falls	.90
South Dakota	31.3	−1.9	Pine Ridge	79	11	Redig	−17	20	.28	−.35	Dumont	1.12	McIntosh	.00
Tennessee	45.7	−2.9	Perryville	87	1	Rugby	2	22	1.93	−1.63	Memphis	4.18	Decatur	.78
Texas	54.5	−2.6	3 stations	94	13	Stratford	9	19	2.03	−.15	Marshall	8.58	6 stations	.00
Utah	40.6	+3.1	St. George	80	5	Silver Lake	2	27	.78	−.16	Silver Lake	4.03	9 stations	.00
Virginia	44.6	−1.9	Williamsburg	79	9	Burkes Garden	−1	23	2.77	+.37	Williamsburg	6.23	2 stations	.99
Washington	42.1	+2.4	Centralia	75	7	Stockdill Ranch	5	30	8.69	+3.26	Big Four	34.56	Sixprong (near)	1.50
West Virginia	41.0	−2.2	4 stations	78	[1]2	Rainelle	−3	23	1.56	−1.18	Pickens	4.09	Parsons	.73
Wisconsin	31.4	−1.9	High Falls	71	9	2 stations	−8	[1]22	1.55	−.29	Platteville	3.28	Plum Island	.32
Wyoming	31.6	−.1	Lovell	75	25	South Pass City	−30	27	.95	+.24	Bechler River	5.00	Powell	.04
Alaska (October)	35.4	+5.6	Wrangell	72	22	2 stations	−1	[1]30	4.06	+.54	Little Port Walter	44.09	Tanana	T
Hawaii	72.5	+.8	3 stations	90	[1]1	Kanalohuluhulu	43	14	7.31	−.81	Pihonua	36.00	3 stations	.00
Pureto Rico	77.7	+1.2	Juana Diaz	98	11	2 stations	58	[1]17	8.27	+1.03	La Mina (El Yunque).	20.07	Ensenada	1.70

[1] Other dates also.

TABLE 2.—*Climatological data for Weather Bureau stations, November 1937*

[Compiled by Annie E. Small, by official authority U. S. Weather Bureau]

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								0–10	*In.*	*In.*
New England							41.6	+2.1										73	4.75	+1.5										6.2		
Eastport	76	67	85	29.90	29.98	−0.03	38.6	+1.9	55	29	44	21	23	33	23	36	33	79	2.37	−1.0	13	12.7	w.	46	e.	14	5	3	22	7.6	T	0.0
Greenville, Maine	1,070	6	40	28.88	29.99	.....	32.4	.....	53	9	40	15	25	25	26	30	27	...	3.37	.....	16	6.1	nw.	27	.....	10	5	4	21	.....	8.8	0
Portland, Maine	103	82	117	29.88	30.01	.00	40.5	+2.5	63	9	47	22	23	34	22	36	30	69	5.77	+2.3	12	8.9	w.	40	se.	28	10	10	10	5.5	.9	.0
Concord	289	60	.....	29.70	30.02	−.04	38.7	+1.0	60	29	48	13	23	30	30	.....	.....	...	7.59	+4.5	9	.....	sw.	.....	.....	.....	8	5	17	.....	5.1	.0
Burlington	403	11	48	29.55	30.00	−.05	37.8	+1.5	61	9	44	14	23	31	26	34	29	73	2.42	−.2	12	10.5	s.	42	s.	2	2	4	24	8.6	T	.0
Northfield	876	12	60	29.04	30.02	−.03	35.6	+2.8	66	9	44	6	23	27	37	31	28	80	3.62	+.7	17	7.0	s.	30	sw.	9	2	5	23	8.2	2.6	.0
Boston [1]	29	33	62	29.98	30.01	−.04	44.0	+2.0	66	9	51	23	23	37	25	38	33	70	4.66	+1.3	11	11.4	w.	37	e.	13	8	11	11	6.2	.3	.0
Nantucket	12	14	90	30.02	30.02	−.03	46.2	+1.8	62	8	52	28	23	40	21	42	39	78	3.36	+.1	11	14.6	w.	38	sw.	9	10	7	13	5.4	T	.0
Block Island	26	11	46	30.01	30.04	−.02	45.8	+1.2	61	13	51	28	22	40	21	42	38	74	4.44	+.8	13	17.6	w.	45	se.	13	14	6	10	4.7	T	.0
Providence	159	215	251	29.86	30.04	−.03	43.8	+3.4	67	8	52	23	23	36	25	39	33	70	5.42	+2.4	11	11.7	nw.	45	se.	13	10	10	10	5.3	T	.0
Hartford	159	66	100	29.88	30.06	−.02	42.8	+3.3	63	9	51	21	23	34	27	.....	.....	...	6.76	+3.2	11	8.2	nw.	30	nw.	6	10	10	10	5.3	1.8	.0
New Haven	106	74	153	29.94	30.06	−.01	44.1	+2.1	64	9	52	23	23	37	23	39	33	68	5.80	+2.4	11	9.0	w.	37	e.	13	12	7	11	5.4	.4	.0
Middle Atlantic States							45.3	+0.4										68	3.30	+0.7										5.4		
Albany	97	97	112	29.94	30.04	−.04	41.7	+2.4	65	8	50	22	12	34	29	36	30	68	1.83	−1.0	12	6.9	nw.	27	se.	28	3	10	17	7.4	1.1	.0
Binghamton	871	57	79	29.12	30.07	−.02	40.4	+1.7	69	8	48	20	12	32	34	.....	.....	...	1.87	−.5	15	6.8	w.	30	sw.	28	2	9	19	8.0	3.6	.0
New York	314	415	454	29.72	30.06	−.03	45.6	+1.4	66	8	52	27	23	39	23	39	32	63	4.12	+1.2	10	16.2	nw.	49	se.	13	14	5	11	5.1	.6	.0
Harrisburg	374	94	104	29.68	30.09	−.02	43.6	+.8	70	8	51	25	21	36	27	37	30	63	4.50	+2.2	9	7.9	w.	22	nw.	3	11	5	14	5.9	T	.0
Philadelphia	114	174	367	29.97	30.10	.00	46.2	+.5	68	8	53	27	21	39	25	40	34	66	3.44	+.7	9	12.6	nw.	34	e.	13	13	8	9	4.7	T	.0
Reading	323	283	306	29.72	30.09	.....	44.8	+2.3	69	8	52	27	21	38	26	38	32	65	1.96	−.8	11	11.4	nw.	45	se.	13	12	8	10	5.5	.7	.0
Scranton	805	72	104	29.18	30.07	−.02	41.4	+.9	73	8	50	22	5	33	35	36	32	74	1.53	−1.2	12	6.9	sw.	25	nw.	9	6	10	14	6.3	2.2	.0
Atlantic City	52	37	172	30.03	30.09	−.01	47.0	+1.4	68	9	54	26	23	40	22	42	36	70	5.07	+2.2	10	16.4	w.	56	ne.	13	12	8	10	5.2	.0	.0
Sandy Hook	22	10	57	30.04	30.06	.....	45.9	+.1	65	2	52	30	23	40	20	41	36	71	3.53	+.3	8	15.7	w.	41	sw.	9	13	6	11	4.8	.1	.0
Trenton	190	88	106	29.87	30.08	.....	44.6	+.2	68	8	52	26	23	37	30	39	32	67	3.54	+.8	9	8.9	w.	27	e.	13	13	7	10	5.2	T	.0
Baltimore	123	100	215	29.97	30.10	−.01	47.6	+1.3	74	8	56	26	21	40	27	41	34	64	5.21	+2.6	7	10.6	sw.	35	ne.	12	14	7	9	4.7	T	.0
Washington	112	62	85	29.98	30.10	−.02	46.6	+1.4	75	8	55	23	24	38	30	40	33	65	3.88	+1.5	9	7.4	nw.	22	nw.	29	12	11	7	4.6	T	.0
Cape Henry	18	8	54	30.09	30.11	.....	49.9	−2.2	72	8	57	28	24	43	31	45	41	75	4.40	+2.0	8	13.2	n.	40	e.	12	14	6	10	4.7	.0	.0
Lynchburg	686	148	184	29.38	30.14	+.01	46.0	−1.2	73	8	56	18	24	36	40	39	33	66	2.14	−.2	7	7.9	nw.	25	sw.	8	15	7	8	4.4	.0	.0
Norfolk	91	80	125	30.03	30.13	+.02	51.2	−.2	72	2	59	30	22	44	26	45	40	71	5.57	+3.4	8	9.8	n.	30	e.	12	15	4	11	5.2	.0	.0
Richmond	144	11	52	29.97	30.13	+.01	47.8	−.5	75	9	58	21	24	37	35	40	35	70	2.44	+.2	9	7.9	sw.	24	sw.	8	18	2	10	4.1	T	.0
Wytheville	2,304	49	55	27.69	30.15	+.02	39.8	−3.2	68	8	50	11	23	30	38	34	29	73	1.03	−1.1	8	7.0	w.	28	w.	26	11	4	15	5.9	T	.0
South Atlantic States							52.0	−2.1										75	2.82	+0.4										4.5		
Asheville	2,253	89	104	27.76	30.18	+.04	43.2	−1.9	72	2	54	13	23	32	41	37	32	72	.64	−1.6	11	9.0	n.	25	n.	20	14	5	11	4.8	.1	.0
Charlotte	779	63	86	29.28	30.14	+.01	48.0	−2.6	71	2	57	20	21	38	29	41	35	66	2.37	−.2	8	7.2	ne.	26	sw.	28	16	5	9	4.2	.0	.0
Greensboro [1]	886	6	56	29.16	30.14	.....	44.3	.....	72	9	56	15	23	33	42	38	34	76	2.14	.....	6	7.7	n.	28	ne.	12	15	4	11	4.3	.0	.0
Hatteras	11	5	50	30.10	30.11	.00	54.8	−1.5	74	9	61	35	21	49	23	51	48	85	5.07	+1.6	11	13.4	n.	37	nw.	5	13	4	13	4.9	.0	.0
Raleigh	376	103	140	29.71	30.12	−.01	49.6	−1.4	75	9	59	22	21	40	31	43	38	70	1.61	−.7	8	8.6	nw.	21	sw.	8	14	9	7	4.1	.0	.0
Wilmington	72	73	107	30.04	30.12	.00	52.8	−3.2	77	9	62	24	22	43	29	47	43	78	6.17	+4.2	11	8.5	ne.	24	nw.	5	15	2	13	4.7	.0	.0
Charleston	48	11	92	30.06	30.11	−.01	55.2	−2.9	75	9	63	26	21	48	21	50	46	78	4.86	+2.7	9	10.2	n.	30	e.	11	16	2	12	4.6	.0	.0
Columbia, S. C	347	70	91	29.75	30.14	+.02	51.5	−2.5	76	10	62	21	22	41	33	44	38	66	2.10	+.1	7	8.2	ne.	27	ne.	11	18	3	9	3.7	.0	.0
Greenville, S. C	1,039	139	146	.....	.....	.....	48.1	−1.5	76	1	57	19	21	39	28	.....	.....	...	.95	−2.2	6	.....	ne.	.....	.....	.....	15	6	9	.....	.0	.0
Augusta	182	62	77	29.92	30.12	−.01	52.0	−2.5	77	10	63	21	21	41	36	45	39	71	1.66	−.7	10	6.0	nw.	18	ne.	11	15	5	10	4.3	.0	.0
Savannah	65	73	152	30.03	30.10	−.02	57.2	−1.3	81	9	67	24	21	47	29	50	46	78	2.98	+.9	9	10.2	e.	43	e.	11	14	5	11	4.4	.0	.0
Jacksonville	43	86	110	30.03	30.08	−.02	59.9	−2.3	79	8	69	26	21	51	26	54	51	82	2.57	+.6	10	8.2	n.	24	nw.	16	11	10	9	5.0	.0	.0
Florida Peninsula							68.2	−1.7										78	2.87	+0.7										4.4		
Key West	22	10	64	29.96	29.98	−.04	72.8	−1.5	83	11	77	56	22	68	16	67	64	80	1.28	−.9	8	11.4	n.	30	nw.	20	15	8	7	4.2	.0	.0
Miami	25	124	168	29.97	30.00	−.06	71.0	−.8	82	5	77	43	21	65	25	64	61	74	.33	−2.6	8	12.3	ne.	29	ne.	24	9	14	7	4.9	.0	.0
Tampa	35	88	197	30.00	30.04	−.04	64.4	−2.5	83	1	73	32	22	56	28	57	54	79	3.44	+1.7	8	12.3	ne.	32	e.	24	16	7	7	4.0	.0	.0
Titusville	43	5	36	29.98	30.03	.....	64.6	−2.0	84	10	74	33	21	55	33	58	56	...	6.44	+4.4	11	.....	nw.	.....	.....	.....	.....	14	9	7	.....	.0	.0
East Gulf States							53.2	−3.4										71	3.68	+0.4										5.1		
Atlanta [1]	976	5	53	29.08	30.13	.00	47.4	−4.7	72	10	57	19	22	38	36	40	35	72	.85	−2.2	9	8.7	nw.	29	nw.	20	13	7	10	4.8	T	.0
Macon	370	79	87	29.73	30.13	.00	51.0	−3.2	78	9	62	21	22	40	35	44	38	68	1.77	−.8	9	7.2	nw.	21	nw.	20	13	7	10	4.7	.0	.0
Thomasville	273	49	58	29.76	30.11	−.01	56.2	−2.3	80	9	67	22	21	46	31	49	46	...	3.71	−1.0	6	.....	ne.	.....	.....	.....	.....	.....	.....	.....	.....	.0	.0
Apalachicola	35	11	.....	30.04	30.08	.....	57.5	−3.8	78	3	66	28	21	49	28	52	48	78	4.06	+1.0	7	9.2	n.	29	e.	11	13	5	12	4.9	.0	.0
Pensacola	56	149	185	30.04	30.10	−.01	55.8	−4.4	74	10	63	27	21	48	28	51	46	74	2.82	−.9	8	12.4	ne.	41	s.	16	14	6	10	4.6	.0	.0
Anniston	741	9	.....	.....	.....	.....	49.2	−2.7	76	2	60	19	21	39	42	.....	.....	...	1.22	−2.0	7	.....	nw.	.....	.....	.....	11	8	11	.....	T	.0
Birmingham	700	11	48	29.35	30.13	+.01	50.2	−3.7	78	2	59	22	21	41	33	43	37	68	1.71	−1.6	9	7.6	n.	21	se.	10	12	6	12	5.4	T	.0
Mobile	57	86	161	30.04	30.11	.00	55.2	−3.4	79	9	64	26	21	47	29	50	45	75	2.23	−1.4	8	9.8	n.	31	nw.	19	11	5	14	5.5	.0	.0
Montgomery	218	92	105	29.88	30.14	+.02	52.6	−3.2	77	8	62	25	21	44	32	46	40	68	3.24	.0	8	7.7	n.	21	n.	20	10	8	12	5.4	.0	.0
Meridian	375	67	92	29.72	30.13	+.01	51.6	−2.6	79	1	62	22	21	42	33	45	40	73	4.25	+.9	7	6.0	ne.	20	w.	28	12	5	13	5.3	.0	.0
Vicksburg	247	82	102	29.86	30.13	+.01	53.8	−2.8	83	1	62	24	21	45	27	46	40	66	3.78	+.1	10	8.3	n.	28	w.	27	15	1	14	5.4	.0	.0
New Orleans	53	76	84	30.06	30.11	+.01	57.7	−3.9	81	9	65	32	20	51	24	51	46	72	1.45	−1.7	9	7.7	ne.	19	ne.	25	14	5	11	4.8	.0	.0
Port Eads, La	9	4	35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Gulf States							55.2	−2.5										72	3.42	+0.5										4.9		
Shreveport	249	92	227	29.86	30.14	+.03	53.6	−2.4	79	2	63	24	20	44	32	47	41	71	7.41	+3.8	10	11.0	ne.	31	nw.	28	13	10	7	4.9	.4	.0
Bentonville	1,303	12	38	28.80	30.20	+.09	43.8	−2.9	80	1	53	12	21	35	32	.....	.....	...	2.35	−.7	9	7.2	s.	21	sw.	7	13	4	13	.....	5.1	T
Fort Smith	457	79	94	29.67	30.16	+.05	48.6	−2.4	84	1	57	20	20	40	36	41	35	66	3.98	+1.1	8	8.3	e.	22	s.	7	8	10	12	5.9	.4	.0
Little Rock	357	94	102	29.77	30.16	+.04	48.7	−3.4	82	1	56	19	21	41	28	43	37	69	3.74	−.4	9	8.2	e.	23	nw.	27	10	8	12	5.7	T	.0
Austin	605	68	90	29.46	30.10	.....	55.8	−2.7	82	1	66	28	20	46	36	50	45	73	3.62	+1.3	5	8.0	s.	27	n.	16	14	13	3	4.0	9.7	.0
Brownsville	57	88	96	29.99	30.05	.....	65.8	−1.4	87	9	75	38	23	57	29	59	55	76	.46	−1.5	6	10.5	se.	32	nw.	23	8	13	9	5.3	.0	.0
Corpus Christi	20	11	78	30.06	30.08	+.01	63.3	−1.0	86	9	71	35	20	55	27	57	54	77	4.09	+2.1	9	10.7	s.	31	n.	18	13	8	9	4.6	.0	.0
Dallas	512	220	227	29.57	30.12	.....	52.4	.....	82	1	61	23	20	44	33	46	40	67	4.56	+2.0	5	12.2	se.	40	w.	15	13	7	10	5.2	2.6	.0
Fort Worth	679	92	110	29.40	30.13	+.03	52.4	−3.1	83	1	62	23	20	43	37	.....	.....	...	4.39	+1.8	5	9.9	n.	40	n.	15	15	7	8	4.0	5.0	.0
Galveston	54	106	114	30.05	30.11	+.02	60.0	−3.3	78	8	66	33	20	54	28	56	52	80	2.93	−.4	6	11.5	n.	35	nw.	18	12	14	4	4.2	.0	.0
Houston	138	292	314	29.97	30.12	.....	58.4	−2.6	83	13	68	28	20	49	29	.....	.....	...	1.37	−2.5	5	12.7	se.	35	ne.	22	10	11	9	5.2	.0	.0
Palestine	510	64	72	29.60	30.14	+.03	53.8	−3.4	82	1	63	25	20	44	34	47	42	70	5.85	+2.4	8	7.3	s.	24	nw.	27	9	8	13	5.5	4.8	.0
Port Arthur	34	98	106	30.08	30.11	.....	57.8	.....	80	9	66	29	20	50	28	52	49	79	2.21	−.9	7	12.8	n.	35	ne.	22	13	8	9	4.7	.0	.0
San Antonio	693	242	301	29.37	30.10	+.02	58.5	−1.8	84	1	69	27	20	48	34	51	45	67	.86	−1.0	5	11.6	e.	32	nw.	10	15	10	5	4.0	.0	.0

See footnotes at end of table.

TABLE 2.—*Climatological data for Weather Bureau stations, November 1937*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice, on ground at end of month
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
							42.7	−2.5										70	1.65	−1.5										6.2		
Chattanooga	762	71	214	29.33	30.15	+.01	48.2	−2.2	76	2	57	20	21	39	33	41	35	65	1.01	−2.4	9	7.5	ne.	38	w.	28	12	7	11	5.2	T	0.0
Knoxville	995	66	84	29.08	30.16	+.03	45.2	−2.7	76	1	55	18	22	36	33	39	35	73	1.06	−2.0	10	6.0	ne.	26	w.	14	13	5	12	5.2	T	.0
Memphis	399	78	86	29.72	30.15	+.03	49.4	−2.3	82	1	56	18	21	42	26	43	35	64	4.18	−.1	11	7.8	e.	27	w.	28	14	2	14	5.5	.2	.0
Nashville	546	168	188	29.58	30.18	+.06	46.1	−2.9	75	1	54	18	20	38	32	41	37	75	2.06	−1.4	11	8.6	nw.	26	w.	28	11	7	12	5.5	.1	.0
Lexington	989	6	...	...	...	...	41.4	−3.4	76	1	50	13	22	32	33	...	...	...	1.74	−1.6	10	...	se.	...	...	...	11	9	10	...	2.9	.0
Louisville	525	188	234	29.56	30.16	+.04	43.3	−3.4	76	1	51	16	20	36	30	38	32	68	1.66	−2.0	9	10.2	nw.	29	w.	28	9	11	10	5.8	T	.0
Evansville	431	76	116	29.68	30.16	+.04	44.2	−2.4	78	1	52	18	20	36	31	38	31	65	1.57	−2.2	10	8.9	s.	33	sw.	8	9	7	14	5.6	2.0	.0
Indianapolis	822	194	230	29.22	30.13	+.03	39.4	−2.9	75	1	47	13	21	32	33	34	28	67	1.94	−1.4	12	11.1	w.	30	w.	28	9	7	14	6.5	2.6	.0
Terre Haute	575	63	149	29.49	30.12	.....	40.5	.....	76	1	49	13	21	32	35	34	29	71	1.67	−1.6	8	9.8	nw.	27	sw.	8	8	10	12	5.8	1.2	.2
Cincinnati	627	11	51	29.44	30.14	+.02	41.6	−.9	71	1	50	17	20	33	34	36	30	72	1.64	−1.2	10	8.0	sw.	29	sw.	28	7	8	15	6.7	2.7	.0
Columbus	822	90	210	29.22	30.12	+.01	40.2	−1.7	66	10	48	16	20	32	35	36	31	73	1.02	−1.8	12	10.1	s.	42	sw.	28	7	7	16	6.9	2.4	.0
Dayton	899	60	163	29.13	30.11	.....	40.2	−1.8	67	1	48	17	20	32	35	...	...	...	1.83	−1.0	11	9.4	w.	29	sw.	8	6	10	14	6.6	4.9	.0
Elkins	1,947	65	83	28.06	30.19	+.07	37.9	−2.4	72	8	48	6	24	28	43	32	28	76	1.24	−1.5	14	6.5	w.	33	w.	28	5	7	18	7.1	5.8	.0
Parkersburg	637	77	84	29.44	30.14	+.02	41.6	−2.2	69	28	50	17	24	33	37	36	31	72	1.16	−1.4	14	6.4	sw.	27	sw.	28	6	6	18	7.0	2.3	.0
Pittsburgh [1]	1,273	39	54	28.72	30.10	.00	39.4	−3.8	70	28	47	16	22	31	40	34	29	71	1.10	−1.2	10	11.7	sw.	35	sw.	28	4	9	17	7.3	1.6	.0
Lower Lake Region							39.4	+0.1										73	1.93	−0.8										7.5		
Buffalo	768	243	280	29.18	30.02	−.03	39.4	.0	65	28	45	22	22	34	31	36	31	75	2.34	−.7	16	18.9	w.	61	sw.	28	4	5	21	7.6	5.2	.1
Canton	448	10	61	29.50	29.99	.....	36.7	+2.8	63	8	43	11	23	30	32	34	31	82	3.04	−.1	14	9.7	w.	34	sw.	28	2	5	23	8.5	1.5	.0
Ithaca	836	77	100	29.12	30.04	.....	40.2	+1.6	66	28	47	23	22	33	29	35	29	67	2.14	−.2	14	9.6	nw.	33	se.	13	5	4	21	7.5	3.0	.0
Oswego	335	71	85	29.64	30.02	−.03	40.3	+1.4	66	8	46	25	12	34	22	36	31	69	2.71	−.7	18	11.0	s.	32	se.	13	1	3	26	9.0	1.2	.0
Rochester	523	86	102	29.46	30.04	−.01	40.2	+1.5	67	8	46	24	22	34	29	35	30	70	2.65	+.1	11	10.2	sw.	38	sw.	2	2	5	23	8.4	5.7	.0
Syracuse	596	65	79	29.39	30.04	−.02	41.5	+2.8	67	28	47	24	12	36	26	...	...	...	2.66	−.1	18	7.9	sw.	25	sw.	8	2	5	23	8.5	3.7	.0
Erie	714	130	166	29.26	30.05	−.01	40.3	−1.1	67	28	46	23	21	34	36	36	31	73	1.89	−1.4	15	15.9	sw.	43	w.	28	8	2	20	7.1	7.8	.0
Cleveland	762	267	318	29.22	30.06	−.01	40.6	−.3	67	7	47	20	30	34	40	36	31	69	1.47	−1.2	16	18.2	sw.	54	sw.	28	8	4	18	6.9	6.0	.0
Sandusky	629	5	67	29.38	30.08	.00	39.7	−1.4	67	1	47	17	30	32	39	...	...	...	.99	−1.4	14	11.1	sw.	30	nw.	2	5	7	18	6.8	3.7	.0
Toledo	628	79	87	29.39	30.08	+.01	38.9	−1.5	66	1	46	16	30	32	34	34	29	72	.73	−1.7	14	11.1	w.	32	w.	2	9	5	16	6.4	.9	.0
Fort Wayne	857	69	84	29.15	30.10	.....	37.1	−3.6	70	1	45	12	23	29	35	33	29	78	1.62	−1.3	12	10.7	w.	30	nw.	2	7	8	15	6.6	2.3	.2
Detroit [1]	626	5	78	29.35	30.05	−.01	38.4	−.9	64	2	45	19	30	32	32	34	29	73	.97	−1.5	9	12.4	sw.	34	nw.	28	6	8	16	6.8	1.0	.0
Upper Lake Region							34.8	−0.4										76	2.23	−0.1										6.8		
Alpena	609	13	89	29.29	29.96	−.05	35.8	+1.4	59	8	41	18	29	30	24	32	28	77	1.75	−.8	13	11.9	sw.	35	sw.	8	2	8	20	8.0	3.2	1.2
Escanaba	612	41	49	29.29	29.98	−.05	33.6	+.5	59	8	40	4	29	28	27	30	25	74	2.63	+.5	11	9.4	nw.	32	sw.	8	7	6	17	7.3	3.4	.2
Grand Rapids	707	70	244	29.25	30.04	−.01	37.9	−.5	65	1	45	19	21	31	31	33	29	75	1.97	−.8	12	13.0	sw.	48	sw.	8	4	8	18	7.1	4.4	T
Lansing	878	5	90	29.07	30.04	.....	36.5	−1.0	63	1	44	15	30	29	30	33	30	82	2.29	−.2	13	10.6	sw.	27	w.	2	6	8	16	7.0	6.8	3.1
Ludington	637	5	54	29.29	30.00	.....	37.8	+.4	60	2	43	17	29	32	32	34	29	...	3.37	+.7	13	...	w.	...	...	...	6	6	18	...	16.3	.4
Marquette	734	44	69	29.13	29.94	−.08	33.0	−.3	54	8	38	8	29	28	23	30	28	84	4.25	+1.3	13	9.3	nw.	26	sw.	4	5	6	19	7.4	16.0	3.5
Sault Sainte Marie	614	11	52	29.25	29.96	−.05	33.8	+1.8	57	8	39	10	29	28	27	31	28	81	2.96	+.3	14	10.3	se.	38	nw.	9	3	6	21	8.1	4.8	1.3
Chicago	673	7	131	29.34	30.08	+.01	37.4	−2.7	73	1	44	14	30	30	30	32	26	66	1.25	−1.1	11	12.2	sw.	29	nw.	2	12	11	7	4.6	2.7	.8
Green Bay	617	109	141	29.31	30.00	−.04	33.4	−.6	60	8	40	5	29	27	25	29	24	71	1.91	−.2	7	12.7	sw.	35	sw.	8	8	5	17	6.9	.5	.3
Milwaukee	681	97	221	29.28	30.03	−.02	35.8	−1.5	67	1	43	11	29	29	27	31	26	70	.85	−.9	8	14.7	w.	36	w.	2	8	10	11	5.5	2.0	.3
Duluth	1,133	5	47	28.73	29.98	−.06	27.6	−2.4	57	4	34	0	28	21	32	24	20	78	1.29	−.2	6	13.8	w.	41	nw.	2	8	6	16	6.6	.8	.0
North Dakota							25.7	−1.1										78	0.41	−0.3										6.5		
Moorhead, Minn	940	50	58	29.00	30.06	−.01	26.2	−.9	66	6	35	−8	21	18	47	23	20	81	.44	−.5	8	9.9	nw.	26	nw.	1	6	4	20	7.1	2.8	.3
Bismarck	1,674	8	57	28.24	30.09	+.02	26.8	−1.7	65	9	36	−5	21	18	41	23	18	72	.41	−.2	6	9.4	nw.	34	nw.	1	10	5	15	6.3	4.6	.2
Devils Lake	1,478	11	44	28.44	30.08	+.02	22.3	−2.2	62	9	31	−10	28	13	36	20	17	84	.41	−.3	6	9.8	nw.	26	nw.	13	8	7	15	6.5	3.1	1.7
Grand Forks	833	12	67	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Williston	1,878	42	50	28.05	30.09	+.03	27.6	+.4	62	9	35	−5	20	20	34	24	19	75	.38	−.2	7	8.9	nw.	32	nw.	26	9	8	13	6.1	3.2	T
Upper Mississippi Valley							36.3	−2.4										69	1.23	−0.8										5.0		
Minneapolis — St. Paul, Minn	919	105	208	29.01	30.02	−.04	31.9	−.5	63	9	39	5	21	25	32	27	21	69	.51	−.8	7	12.2	w.	38	w.	2	7	10	13	6.3	1.2	T
La Crosse	714	11	48	29.27	30.07	.00	32.8	−2.4	62	1	41	5	29	25	29	29	24	72	2.35	+.8	6	7.0	s.	19	w.	2	9	5	16	6.0	7.4	4.5
Madison	974	70	78	28.97	30.05	−.01	32.9	−2.3	63	9	41	5	29	25	29	29	25	76	.78	−1.0	8	10.6	nw.	26	w.	2	11	11	8	5.2	4.1	2.6
Charles City	1,015	10	51	28.97	30.00	−.08	31.0	−2.0	65	9	41	−1	21	21	35	26	22	73	.66	−.9	5	7.8	nw.	25	sw.	8	14	4	12	4.7	5.9	2.9
Davenport	606	66	151	29.43	30.11	+.03	36.3	−2.7	76	1	45	8	21	28	32	31	30	67	.63	−1.2	6	11.0	nw.	32	sw.	8	16	4	10	4.5	4.0	1.4
Des Moines	861	5	99	29.18	30.12	+.04	35.1	−3.3	73	1	45	−1	21	25	36	30	23	64	.65	−.8	5	10.6	nw.	30	nw.	13	12	9	9	5.0	5.3	2.0
Dubuque	699	60	79	29.31	30.09	+.02	34.2	−2.8	69	1	44	4	29	25	35	29	23	68	1.15	−.6	6	7.0	nw.	22	nw.	2	16	4	10	4.2	5.9	2.4
Keokuk	614	64	78	29.46	30.14	+.05	37.8	−3.3	80	1	47	4	21	28	33	32	25	63	1.92	.0	7	8.7	sw.	30	nw.	13	16	5	9	4.3	5.5	2.8
Cairo	358	87	93	29.76	30.16	+.04	45.5	−1.8	81	1	53	16	21	28	31	39	33	68	1.99	−1.7	10	9.0	n.	25	n.	28	10	8	12	5.6	1.3	.0
Peoria	609	11	45	29.44	30.13	+.04	36.7	−.8	81	1	46	4	21	28	34	31	27	74	1.28	−1.1	8	8.1	s.	21	w.	1	20	2	8	3.9	4.1	1.0
Springfield, Ill	636	5	191	29.43	30.13	+.03	38.8	−3.4	82	1	47	9	21	30	35	34	28	70	1.62	−.9	8	12.0	s.	29	nw.	1	10	11	9	5.2	2.6	.6
St. Louis	568	179	303	29.52	30.14	+.04	42.1	−3.3	83	1	50	14	21	34	32	36	28	62	1.19	−1.6	8	12.4	w.	35	sw.	7	12	9	9	4.8	2.5	.2
Missouri Valley							37.3	−2.1										65	0.91	−0.5										5.0		
Columbia, Mo	784	6	66	29.28	30.14	+.05	40.0	−3.3	84	1	49	6	21	31	35	...	...	...	2.27	+.1	5	8.5	nw.	25	nw.	8	11	12	7	5.1	2.1	T
Kansas City [1]	750	32	45	29.32	30.15	+.06	39.8	−3.9	83	1	49	5	21	30	35	34	27	65	1.33	−.5	5	9.9	sw.	36	w.	13	9	12	9	5.4	3.4	.7
St. Joseph	967	11	49	29.08	30.15	.....	38.6	.....	79	1	48	4	21	30	33	32	26	65	1.22	−.4	7	9.2	nw.	32	w.	13	17	6	7	3.9	6.1	3.9
Springfield, Mo	1,324	98	104	28.71	30.14	+.04	42.0	−3.7	81	1	50	9	21	34	30	36	29	64	1.72	−1.1	11	10.5	s.	27	w.	13	14	5	11	5.2	7.5	.0
Topeka	987	65	87	29.06	30.14	.....	40.1	−2.7	81	1	50	7	21	30	32	34	27	65	1.34	−.2	5	9.5	s.	27	s.	7	11	11	8	4.6	6.3	1.5
Lincoln	1,189	11	81	28.82	30.12	+.04	38.0	−1.1	76	7	48	4	21	28	33	32	24	60	.14	−.9	3	10.7	s.	35	nw.	13	12	9	9	4.7	1.6	.0
Omaha [1]	982	31	44	29.05	30.13	+.05	36.2	−2.3	74	7	46	−3	21	26	36	31	24	66	.26	−.8	4	11.5	nw.	36	nw.	13	11	6	13	5.6	1.7	.0
Valentine	2,598	47	54	27.34	30.13	+.05	33.8	−.8	71	9	44	−6	20	24	43	28	22	68	.17	−.4	4	9.8	w.	34	nw.	12	10	7	13	5.7	1.8	.0
Sioux City	1,138	64	106	28.86	30.11	+.03	34.4	−.8	73	9	44	−9	21	25	34	29	22	65	.25	−.8	5	11.1	nw.	40	nw.	13	11	10	9	5.1	4.4	T
Huron	1,307	59	74	28.67	30.11	+.03	31.9	−.5	71	9	41	−8	21	21	44	25	19	68	.43	−.2	6	9.8	nw.	30	nw.	1	14	6	10	4.9	4.0	.1
Northern Slope							33.9	+1.1										69	0.51	−0.2										6.9		
Havre	2,507	11	67	27.39	30.10	+.07	29.8	−1.4	65	9	39	2	27	21	36	26	20	72	.28	−.3	6	9.3	w.	34	sw.	8	7	3	20	7.4	3.6	.2
Helena	4,124	85	111	25.82	30.09	−.01	35.2	+2.0	62	10	43	10	18	28	27	30	23	64	.31	−.4	10	7.5	sw.	30	w.	25	3	8	19	7.9	5.2	.0
Missoula	3,263	80	91	...	...	...	38.4	+4.9	66	10	45	20	18	32	28	...	...	...	.54	−.7	10	7.4	e.	30	e.	17	1	6	23	8.8	.9	.0
Kalispell	2,973	48	56	26.95	30.06	−.01	35.4	+3.0	60	9	42	12	30	29	24	33	29	79	1.24	−.1	14	5.1	w.	19	sw.	25	1	5	24	8.4	5.4	1.4
Miles City	2,371	48	55	27.52	30.08	+.01	32.1	+1.2	67	9	41	7	27	23	36	28	22	69	.27	−.3	7	6.5	s.	26	nw.	26	5	9	16	7.1	4.3	2.1
Rapid City	3,259	50	58	26.65	30.10	+.02	34.4	−1.5	69	11	44	3	19	24	41	29	23	70	.22	−.3	5	8.1	nw.	32	nw.	12	9	9	12	6.0	2.4	T
Cheyenne [1]	6,144	5	39	23.94	30.09	+.02	34.0	−.8	65	9	46	−8	18	22	43	28	21	65	.90	+.4	9	12.3	w.	49	nw.	12	13	4	13	5.4	7.6	T
Lander	5,352	60	68	24.66	30.13	+.03	32.2	+1.9	61	10	44	8	20	20	36	26	19	62	.57	.0	4	5.1	sw.	38	w.	12	11	12	7	4.9	6.4	T
Sheridan	3,790	10	47	26.12	30.12	.....	32.4	.....	65	5	44	−6	19	21	48	28	22	71	.70	+.1	7	4.9	nw.	27	nw.	26	7	6	17	6.9	8.2	2.7
Yellowstone Park	6,241	12	46	23.89	30.18	+.07	31.0	+1.9	53	10	40	7	17	22	31	26	21	68	.47	−.3	13	7.7	sw.	27	sw.	25	5	5	20	7.5	8.7	2.1
North Platte	2,821	11	51	27.12	30.12	+.04	36.6	.0	71	9	48	6	19	25	40	30	23	67	.06	−.4	4	7.6	w.	32	nw.	12	11	7	12	5.3	.6	T

See footnotes at end of table.

TABLE 2.—*Climatological data for Weather Bureau stations, November 1937*—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice, on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
Middle Slope							**41.6**	**−1.2**										**59**	**0.74**	**−0.2**										**4.6**		
Denver	5,292	106	113	24.74	30.08	+0.02	40.6	+0.8	72	11	52	8	19	29	33	31	19	47	0.51	0.0	5	7.9	s.	35	w.	12	14	8	8	4.8	4.9	0.0
Pueblo	4,685	80	86	25.32	30.08	+.03	40.3	+.9	70	24	54	10	19	26	40	32	21	53	.19	−.2	3	6.5	nw.	32	w.	12	14	13	3	3.9	2.0	.0
Concordia	1,392	50	58	28.63	30.15	+.07	39.2	−2.2	77	7	49	10	20	30	31	33	26	65	.20	−.8	3	9.0	n.	29	s.	24	12	13	5	4.5	1.0	.0
Dodge City	2,509	10	86	27.46	30.12	+.05	41.4	−1.2	78	7	53	9	19	30	35	33	24	58	.34	−.4	4	11.4	s.	35	sw.	7	15	9	6	3.9	1.6	T
Wichita	1,358	85	93	28.68	30.14	+.06	42.0	−2.8	79	1	51	10	19	33	28	35	28	64	.75	−.6	4	9.9	s.	31	sw.	1	13	8	9	4.8	4.9	.0
Oklahoma City	1,214	10	47	28.82	30.13	+.05	45.9	−2.9	82	1	54	18	19	37	30	39	34	68	2.47	+.6	6	10.1	s.	27	n.	27	10	7	13	5.7	T	.0
Southern Slope							**51.4**	**−0.4**										**56**	**0.72**	**−0.4**										**4.3**		
Abilene	1,738	10	52	28.28	30.11	+.04	51.8	−1.7	81	1	63	22	20	41	38	43	36	60	.80	−.6	4	9.6	s.	27	s.	7	13	11	6	4.6	1.7	.0
Amarillo	3,676	10	49	26.31	30.08	+.03	47.6	+2.1	83	1	60	16	19	35	38	36	25	48	.14	−.8	4	9.5	s.	30	n.	27	9	9	12	5.6	1.1	.0
Del Rio	960	60	71	29.06	30.06	+.01	58.5	−1.5	86	15	68	27	20	49	34	51	44	64	1.84	+.6	4	8.9	se.	30	nw.	27	16	6	8	4.0	.0	.0
Roswell	3,566	75	85	26.42	30.07	+.04	47.8	−.3	77	4	62	18	23	33	51	38	27	50	.08	−.8	1	6.9	s.	34	ne.	27	16	14	0	3.0	.0	.0
Southern Plateau							**51.6**	**+3.0**										**46**	**0.07**	**−0.6**										**2.9**		
El Paso	3,778	82	101	26.20	30.04	+.04	55.2	+2.5	79	1	68	30	19	42	34	43	30	42	.22	−.3	2	7.0	e.	23	se.	5	22	7	1	2.2	.0	.0
Albuquerque [1]	4,972	5	39	25.09	30.05	------	45.6	+2.3	73	1	61	19	28	30	38	34	24	49	.01	−.4	1	6.8	n.	33	nw.	21	18	9	3	2.9	.0	.0
Santa Fe	7,013	38	53	23.26	30.05	+.02	42.2	+3.3	65	1	54	20	19	30	29	32	21	47	.12	−.6	1	5.5	e.	26	w.	7	17	7	6	3.8	T	.0
Flagstaff	6,907	10	39	23.38	30.01	−.01	40.3	+5.7	67	3	59	14	27	22	47	30	----	51	.08	−1.4	1	7.5	n.	23	s.	6	12	16	2	3.8	.0	.0
Phoenix	1,107	39	51	28.82	29.98	.00	62.3	+2.6	90	3	78	40	28	47	37	48	36	42	.00	−.7	0	5.1	e.	16	w.	7	18	9	3	3.1	.0	.0
Yuma	141	9	54	29.83	29.98	.00	64.1	+1.7	90	3	80	43	14	49	37	51	40	48	.00	−.3	0	4.2	ne.	20	nw.	17	23	7	0	1.6	.0	.0
Independence	3,957	5	26	------	------	------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Middle Plateau							**43.0**	**+4.1**										**56**	**0.73**	**+0.1**										**4.9**		
Reno	4,527	61	76	25.50	30.06	−.05	45.0	+3.5	68	5	58	24	30	32	37	37	29	57	1.11	+.5	5	6.2	sw.	29	se.	23	11	13	6	4.7	T	.0
Tonopah	6,090	12	20	------	------	------	44.0	------	63	2	52	30	30	36	28	34	20	40	T	----	0	----	se.	----	----	----	----	----	----	----	----	----
Winnemucca	4,344	18	56	25.66	30.09	−.05	42.1	+3.7	66	2	55	19	11	29	44	35	28	62	1.17	+.5	5	7.8	sw.	31	sw.	11	12	13	5	5.5	.0	.0
Modena	5,473	10	43	24.66	30.05	−.03	41.0	+4.6	69	2	58	12	30	25	42	31	20	50	.22	−.4	2	8.8	w.	32	s.	6	12	12	6	4.4	T	.0
Salt Lake City [1]	4,227	32	46	25.79	30.09	−.03	43.6	------	66	11	54	23	30	33	33	37	31	66	.69	----	8	8.0	se.	60	nw.	11	8	10	12	5.7	T	.0
Grand Junction	4,602	60	68	25.44	30.05	−.03	44.0	+4.7	66	1	55	18	29	33	34	36	29	60	.42	−.2	5	5.3	se.	23	sw.	6	17	4	9	4.0	T	.0
Northern Plateau							**42.9**	**+4.0**										**72**	**2.09**	**+0.7**										**7.8**		
Baker	3,471	36	54	26.47	30.09	−.07	41.4	+5.4	61	10	49	23	30	34	33	37	32	74	1.79	+.7	13	6.4	se.	20	s.	10	4	3	23	8.0	T	.0
Boise	2,739	79	87	27.22	30.11	−.06	45.7	+4.7	67	10	54	25	7	38	28	40	34	66	1.71	+.4	15	6.2	se.	21	se.	22	6	6	18	7.2	T	.0
Pocatello	4,477	60	68	25.52	30.09	−.05	40.7	+4.0	61	9	49	20	30	33	33	34	28	64	1.54	+.6	10	9.7	se.	29	sw.	28	6	9	15	6.7	3.0	.0
Spokane	1,929	101	110	27.96	30.04	−.06	40.4	+1.9	55	8	46	27	19	35	23	38	35	80	3.05	+1.0	18	7.4	s.	28	sw.	8	1	4	25	8.6	2.8	.0
Walla Walla	991	57	65	28.95	30.04	−.09	46.0	+3.2	68	10	52	30	30	40	25	42	38	76	2.89	+.9	18	5.9	s.	22	sw.	25	1	5	24	8.9	.0	.0
Yakima	1,076	58	67	28.85	30.01	------	43.4	+4.5	62	3	51	26	6	36	28	40	36	75	1.57	+.7	10	5.0	nw.	21	sw.	14	4	4	22	7.7	2.0	.0
North Pacific Coast Region							**49.5**	**+3.4**										**84**	**9.78**	**+3.4**										**8.3**		
North Head	211	11	56	29.71	29.94	−.11	50.8	+2.6	65	1	55	41	29	47	14	49	48	89	12.53	+4.1	27	18.8	e.	72	s.	24	4	4	22	7.7	.0	.0
Seattle	125	90	321	29.80	29.93	−.11	48.8	+3.2	68	1	53	33	13	44	16	46	43	82	8.32	+3.3	24	10.9	se.	40	s.	27	2	6	22	8.3	4.0	.0
Tatoosh Island	86	10	54	29.78	29.88	−.09	49.0	+3.1	60	1	52	36	13	45	16	46	44	82	13.65	+1.7	26	20.1	e.	49	e.	19	3	6	21	8.0	T	.0
Medford [1]	1,329	29	58	28.62	30.04	------	47.7	+3.9	66	22	56	24	30	40	29	45	42	85	5.69	+3.2	18	----	nw.	----	----	----	3	6	21	8.0	T	.0
Portland, Oreg.	153	68	106	29.82	29.97	−.13	49.6	+2.8	63	1	54	38	28	45	15	47	44	82	10.08	+4.0	23	7.3	se.	22	e.	1	1	5	24	8.8	.0	.0
Roseburg	510	45	76	29.46	30.02	−.10	51.0	+5.1	69	2	57	36	30	45	25	49	46	82	8.41	+3.8	22	4.0	s.	18	sw.	8	2	4	24	8.9	.0	.0
Middle Pacific Coast Region							**55.6**	**+1.8**										**77**	**7.31**	**+3.9**										**6.0**		
Eureka	62	73	89	29.99	30.06	−.05	54.1	+3.0	68	1	60	42	28	48	22	51	49	83	10.96	+5.8	18	7.7	se.	27	sw.	10	6	5	19	7.3	.0	.0
Redding [1]	722	20	34	------	------	------	54.6	+.5	76	3	62	40	24	48	26	49	44	70	13.12	+8.8	12	8.1	nw.	29	se.	22	9	3	18	6.6	.0	.0
Sacramento	69	92	115	30.00	30.06	−.01	55.6	+2.0	75	3	65	37	30	46	31	51	47	74	2.69	+.8	9	5.8	se.	22	se.	13	12	9	9	4.7	.0	.0
San Francisco	155	112	132	29.90	30.07	−.02	58.2	+1.9	74	3	64	49	7	53	19	54	52	82	2.46	+.1	9	6.4	w.	27	sw.	11	10	9	11	5.3	.0	.0
South Pacific Coast Region							**59.6**	**+1.3**										**74**	**0.02**	**−0.9**										**4.5**		
Fresno	327	97	105	29.73	30.09	+.03	57.0	+2.8	80	4	69	37	26	45	32	51	45	67	.05	−.9	3	4.9	nw.	14	nw.	6	14	10	6	4.2	.0	.0
Los Angeles	338	159	191	29.68	30.05	+.03	61.7	+.8	83	27	70	46	29	53	31	54	51	74	.00	−1.2	0	5.1	sw.	14	nw.	7	14	10	6	4.0	.0	.0
San Diego	87	62	70	29.95	30.04	+.02	60.0	+.3	71	27	67	48	28	53	23	56	53	82	.02	−.7	1	5.2	nw.	15	w.	30	10	11	9	5.2	.0	.0
West Indies																																
San Juan, P. R.	82	9	54	29.79	29.87	------	80.0	+1.6	89	3	85	72	21	75	14	----	----	---	8.52	+1.8	19	8.2	e.	27	e.	25	5	21	4	5.2	.0	.0
Panama Canal																																
Balboa Heights	118	6	92	------	[2] 29.82	.00	79.1	.0	91	26	85	71	4	73	17	----	----	[3]88	10.18	−.4	25	4.9	nw.	24	nw.	30	0	9	21	7.9	.0	.0
Cristobal	36	6	97	------	[2] 29.83	.00	79.9	+.6	90	6	85	71	16	75	16	75	74	[3]86	23.23	+1.0	29	7.4	w.	34	nw.	3	0	9	21	8.5	.0	.0
Alaska																																
Fairbanks	454	11	87	------	[2] 29.94	------	10.4	+7.3	36	2	17	−11	28	4	23	----	----	81	.53	−.1	5	5.1	ne.	23	n.	20	10	8	12	----	9.1	5.4
Juneau	80	96	116	[2] 29.69	[2] 29.78	------	37.2	+1.8	54	4	42	18	25	33	20	33	26	66	6.45	−2.5	15	9.1	s.	32	ne.	24	8	2	20	6.9	11.5	.0
Nome	22	5	32	[2] 29.79	[2] 29.81	------	24.6	+8.9	40	13	30	3	30	19	22	25	21	79	2.02	+1.2	9	9.1	ne.	34	se.	13	11	5	14	5.5	3.5	T
Hawaiian Islands																																
Honolulu	38	86	100	[2] 29.99	[2] 30.04	------	75.6	+1.1	82	19	80	66	13	71	15	69	65	71	1.14	−2.7	15	9.8	e.	34	e.	8	10	18	2	4.4	.0	.0

[1] Observations taken at airport.

[2] Observations taken bi-hourly.

[3] Pressure not reduced to mean of 24 hours.

TABLE 3.—*Data furnished by the Canadian Meteorological Service, November 1937*

Stations	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max.+ mean min.÷2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99												
Sydney, Cape Breton Island	48	29.80	29.95	−0.01	40.0	+1.6	45.6	34.3	60	23	7.33	+2.25	0.2
Halifax, Nova Scotia	88	29.73	29.99	.00	40.4	+1.6	44.9	35.8	57	25	8.75	+3.58	T
Yarmouth, Nova Scotia	65	29.89	30.00	.00	42.2	+2.0	47.4	37.1	55	29	4.92	+.88	.4
Charlottetown, Prince Edward Island	38	29.89	29.98	+.02	37.6	+1.6	42.4	32.7	55	24	6.63	+3.24	1.5
Chatham, New Brunswick	28	29.84	29.95	−.03	33.0	+.8	39.3	26.7	52	14	5.69	+2.29	4.9
Father Point, Quebec	20	29.91	29.93	−.03	32.0	+2.6	36.6	27.4	49	12	3.63	+.29	16.5
Quebec, Quebec	296	29.65	29.98	−.02	33.2	+3.5	38.0	28.4	51	16	4.27	+.84	1.6
Doucet, Quebec	1,236	28.54	29.93	−.07	27.0	+3.2	33.1	21.0	48	7	3.22	+.63	11.4
Montreal, Quebec	187	29.78	29.99	−.03	36.0	+2.9	40.5	31.5	54	18	3.87	+.40	.1
Ottawa, Ontario	236	29.70	30.02	.00	34.2	+1.9	40.0	28.5	55	14	3.88	+1.18	T
Kingston, Ontario	285	29.68	30.00	−.04	39.0	+2.6	44.1	34.0	59	20	4.66	+1.72	.2
Toronto, Ontario	379	29.60	30.02	−.03	38.6	+1.0	43.9	33.2	59	20	1.80	−.96	T
Cochrane, Ontario	930	28.86	29.90	−.10	25.3	+1.9	30.8	19.9	44	5	2.52	+.42	11.5
White River, Ontario	1,344	28.54	29.92	−.07	23.4	+.7	30.0	16.7	48	−15	3.02	+.56	17.4
London, Ontario	808	29.14	30.04	−.02	35.8	−1.0	43.1	28.5	59	17	1.42	−2.01	4.6
Southampton, Ontario	656	29.24	29.98	−.04	36.8	+.1	42.4	31.1	60	20	2.25	−1.30	6.4
Parry Sound, Ontario	688	29.26	29.96	−.05	35.8	+2.1	41.1	30.4	57	10	4.72	+.64	14.6
Port Arthur, Ontario	644	29.23	29.96	−.06	26.4	−.8	32.2	20.5	52	3	1.80	+.28	5.4
Winnipeg, Manitoba	760	29.18	30.04	−.05	23.1	+1.3	29.8	16.4	53	−11	.86	−.22	4.0
Minnedosa, Manitoba	1,690	28.18	30.07	+.02	20.8	−.9	28.2	13.4	56	−14	.25	−.65	2.5
Le Pas, Manitoba	860	29.10	30.12	+.14	13.4	−4.0	20.7	6.2	45	−27	2.64	+1.84	26.4
Qu'Appelle, Saskatchewan	2,115	27.70	30.06	.00	21.4	−1.0	29.5	13.3	53	−16	.63	−.38	5.3
Moose Jaw, Saskatchewan	1,759	28.03	30.08	+.04	24.3	+.1	32.3	16.3	56	−15	.40	−.22	3.2
Swift Current, Saskatchewan	2,392	27.43	30.10	+.04	25.0	−1.1	32.0	18.1	58	−7	.65	+.09	6.5
Medicine Hat, Alberta	2,365	27.52	30.08	+.04	26.5	−3.5	34.9	18.1	61	−8	1.26	+.57	12.6
Calgary, Alberta	3,540												
Banff, Alberta	4,521	25.30	30.02	−.02	22.9	−1.0	30.9	14.9	45	−18	3.27	+1.82	30.9
Prince Albert, Saskatchewan	1,450	28.52	30.14	+.10	18.0	−.6	24.6	11.4	44	−41	1.66	+.78	16.6
Battleford, Saskatchewan	1,502	28.30	30.12	+.08	17.7	−2.5	26.0	9.3	50	−36	.79	+.34	7.9
Edmonton, Alberta	2,150	27.70	30.08	+.10	19.0	−6.7	25.8	12.2	55	−17	1.05	+.36	10.5
Kamloops, British Columbia	1,262	28.69	30.07	+.05	35.0	−.6	40.0	29.9	57	11	1.82	+.90	14.8
Victoria, British Columbia	230	29.67	29.93	−.13	46.1	+1.5	50.0	42.2	59	29	5.41	+.34	8.5
Barkerville, British Columbia	4,180												
Estevan Point, British Columbia	20	29.83	29.85	−.15	47.0	+1.8	52.3	41.7	62	30	15.40	−.30	T
Prince Rupert, British Columbia	170	29.56	29.76	−.07	42.7	+1.3	48.3	37.1	58	28	4.43	−8.30	.0
St. George's, Bermuda	158		30.05	.00	69.9	+1.7	75.2	64.7	80	58	4.91	.00	.0
LATE REPORTS FOR OCTOBER 1937													
Montreal, Quebec	187	29.78	29.99	−0.03	47.0	+0.4	52.8	41.1	77	29	4.53	+1.25	T
Ottawa, Ontario	236	29.70	29.96	−.08	44.4	−1.4	52.0	36.7	73	19	4.22	+.74	T
Calgary, Alberta	3,540	26.32	30.02	+.03	44.8	+2.9	54.9	34.8	79	24	.81	+.16	2.5

TABLE 4.—*Severe local storms, November 1937*

[Compiled by Mary O. Souder from reports submitted by Weather Bureau officials]

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Buffalo, N. Y., and Great Lakes region.[1]	9					Wind	1 person injured, necessitating hospital treatment.
Newark, N. J., and vicinity[1]	13			1		Wind and rain	Boy, in boat, drowned, being carried out in Raritan Bay. Coast guards were unable to locate him. Windows and trees broken.
Rhode Island	13					Wind	Trees and wires down; highways littered with debris. Typical southeast storm with shipping storm bound along the entire New England coast. Numerous accidents reported.
Washington, northwestern portion of State.[1]	13–14					Snow	This section isolated for 2 days by snowdrifts 10 to 12 feet high.
Seattle, Wash., and vicinity[1]	17			3		do	Some communities isolated; traffic disrupted; 3 persons killed by high tension wire.
New England[1]	22			8		Snow and glaze	Many injured because of ice-covered roads. From 4 to 8 inches of snow fell in sections of western and northern New England.
Atlantic City, N. J., and vicinity.[1]	28					Heavy rain	Many streets flooded; 3 accidents reported.
Erie, Wyoming, and Cattaraugus Counties, N. Y.	28				$15,000	Wind	Plate glass windows broken; considerable damage to telephone and power lines and roofs of buildings. In Buffalo, maximum wind velocity of 61 miles an hour was recorded.
Hartford, Conn.	28					Heavy rain	Portion of the city flooded when a brook overflowed. Water from 1 to 3 feet flooded cellars and stalled motors; sewers inadequate; several accidents reported.
Providence, R. I.	28					Wind and rain	Numerous washouts and motor accidents reported; wired down.

[1] From press reports.

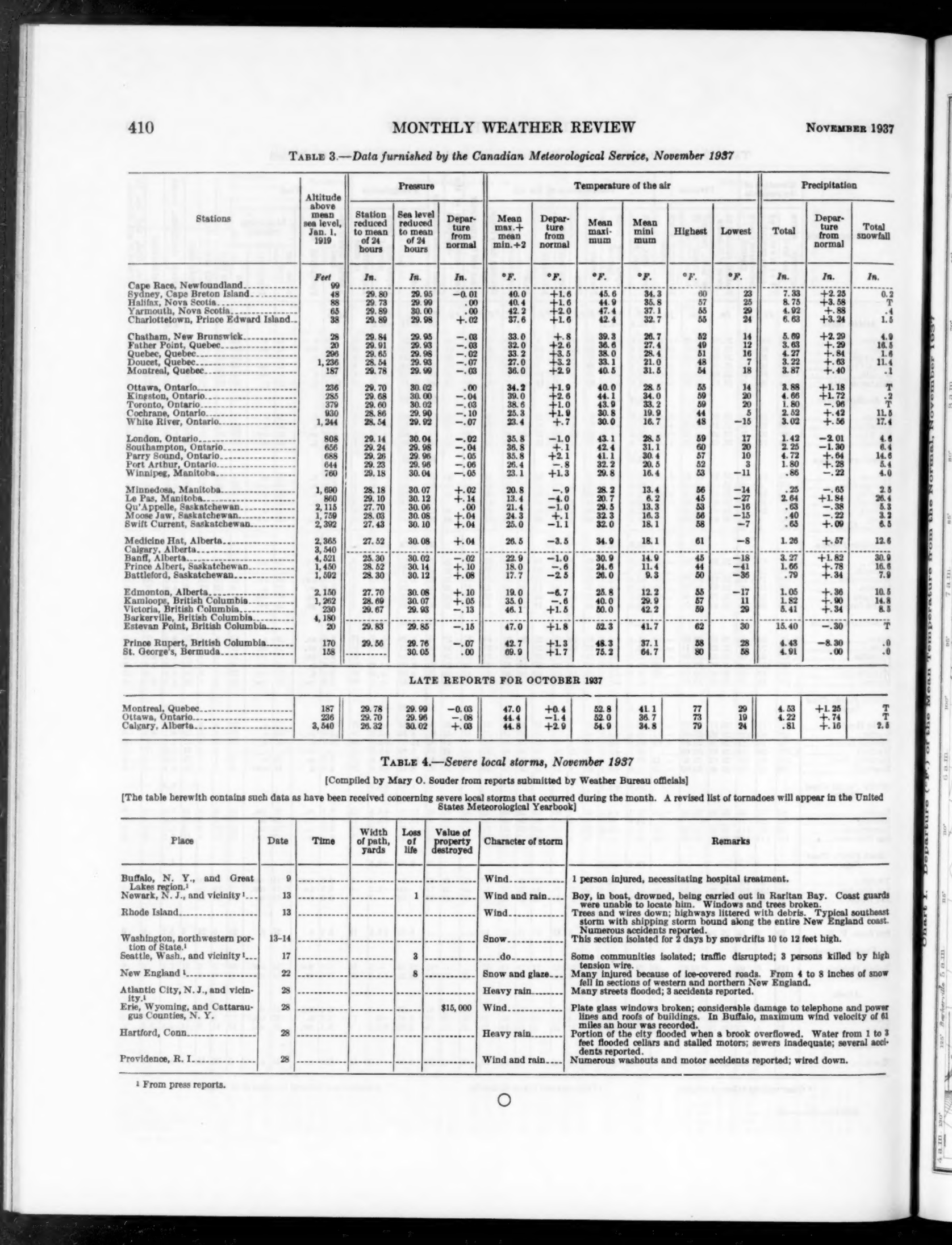
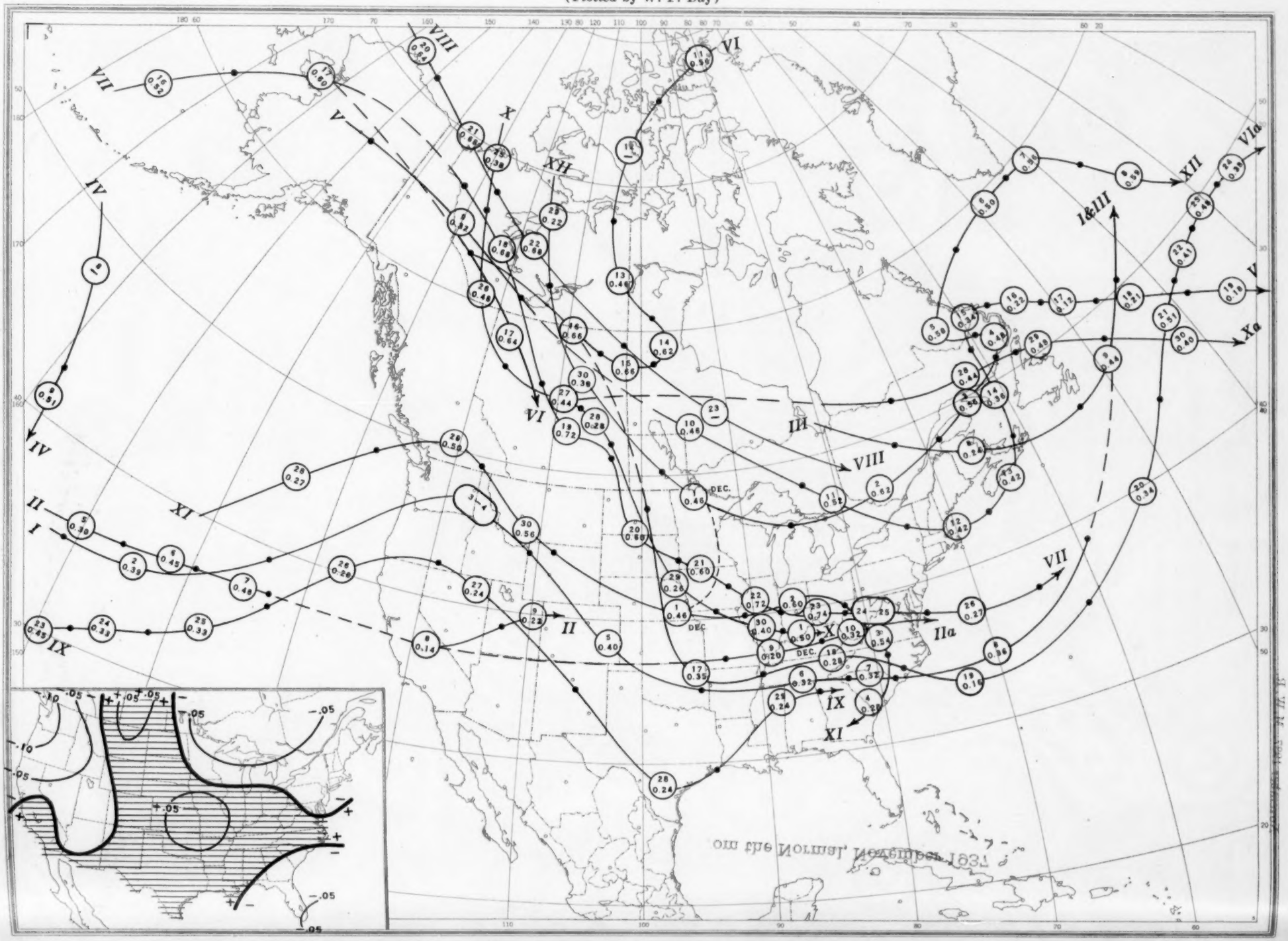


Chart I. Departure (°F.) of the Mean Temperature from the Normal, November 1937

Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency
Statute Miles
Kilometers

Chart II. Tracks of Centers of Anticyclones, November 1937. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by W. P. Day)



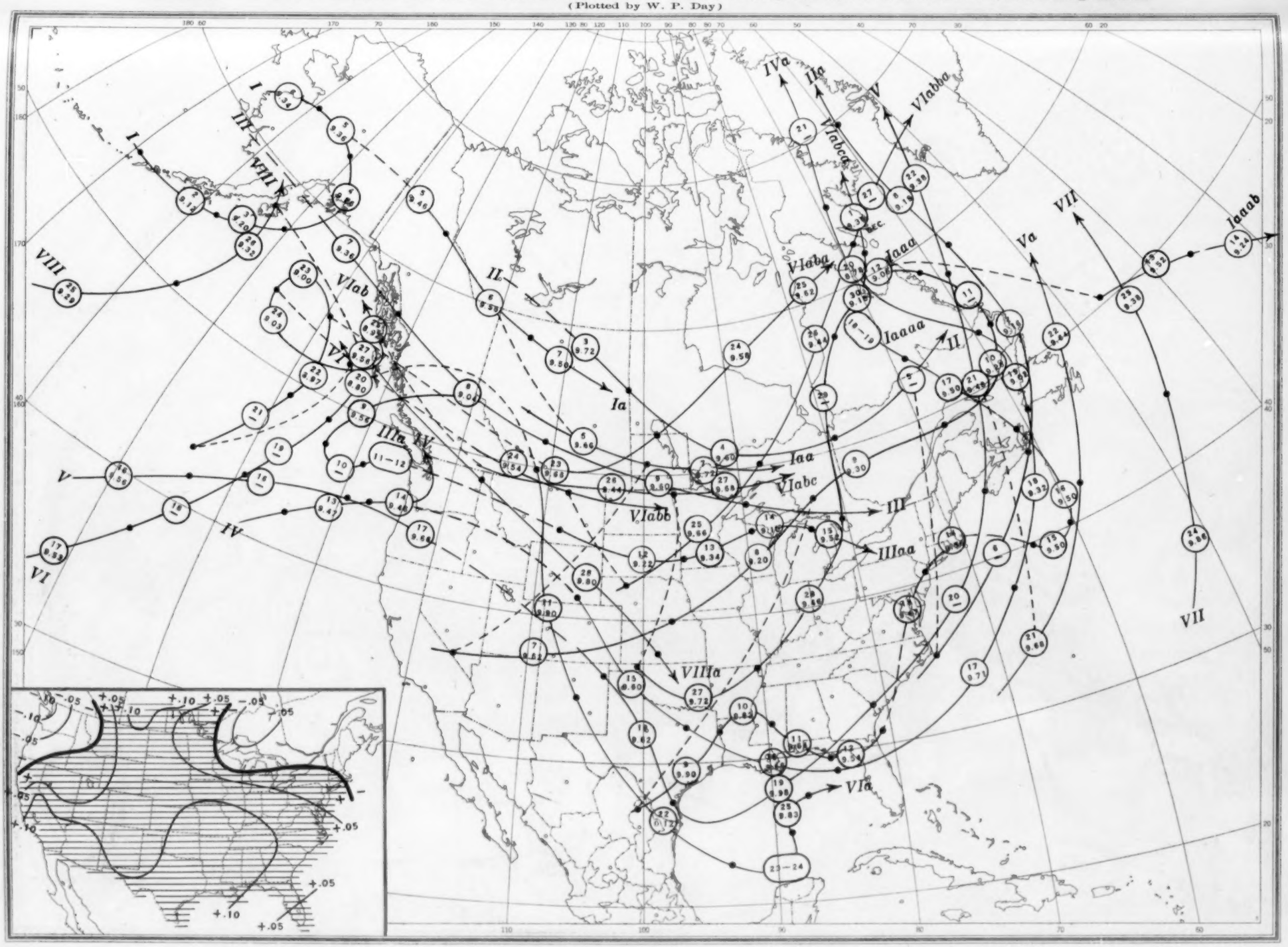
Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, November 1937. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by W. P. Day)

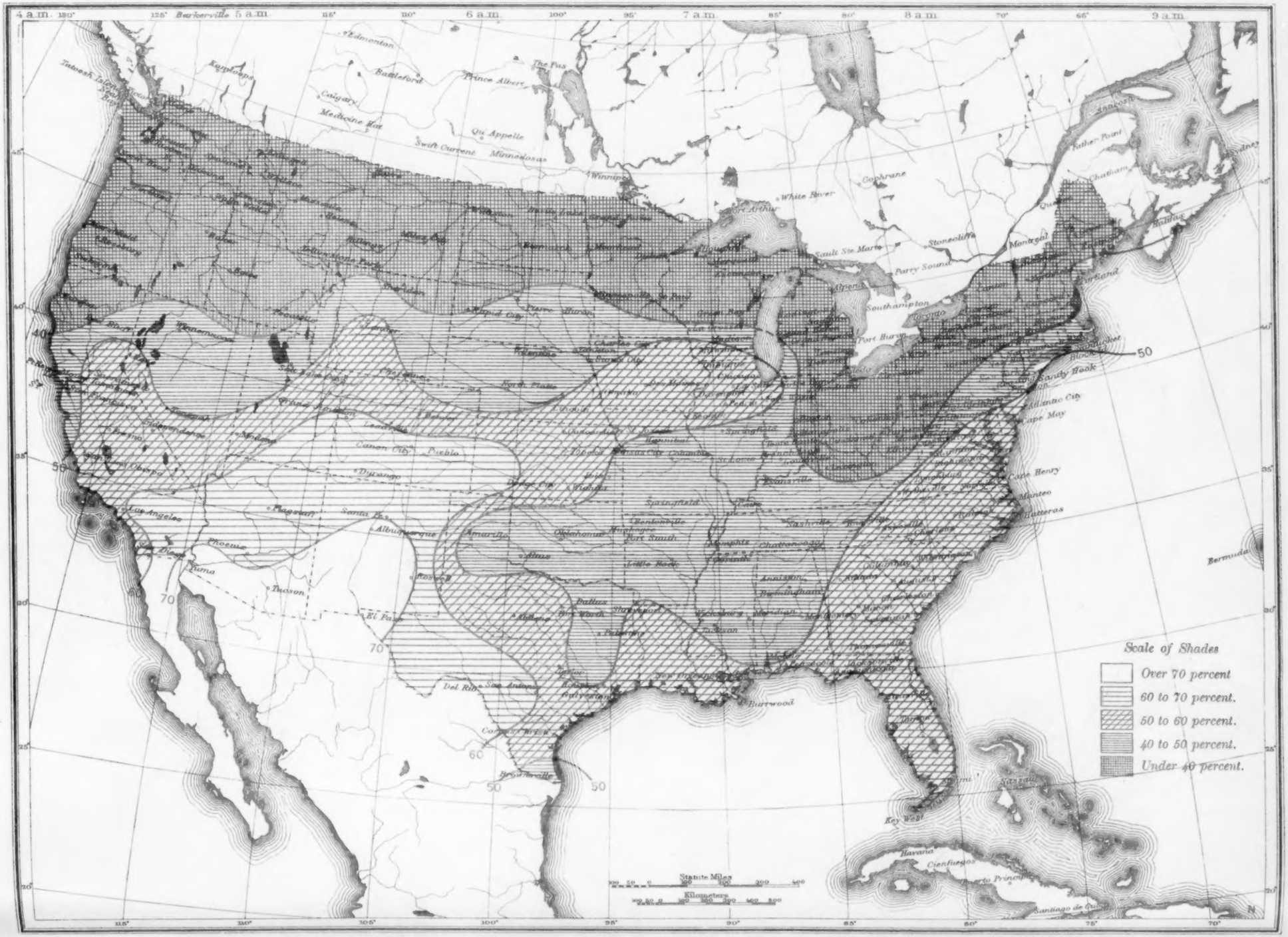
Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, November 1937. (Inset) Change in Mean Pressure from Preceding Month
(Plotted by W. P. Day)



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, November 1937



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November 1937. M.W.R.

Chart V. Total Precipitation, Inches, November 1937. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, November 1937. (Inset) Departure of Precipitation from Normal

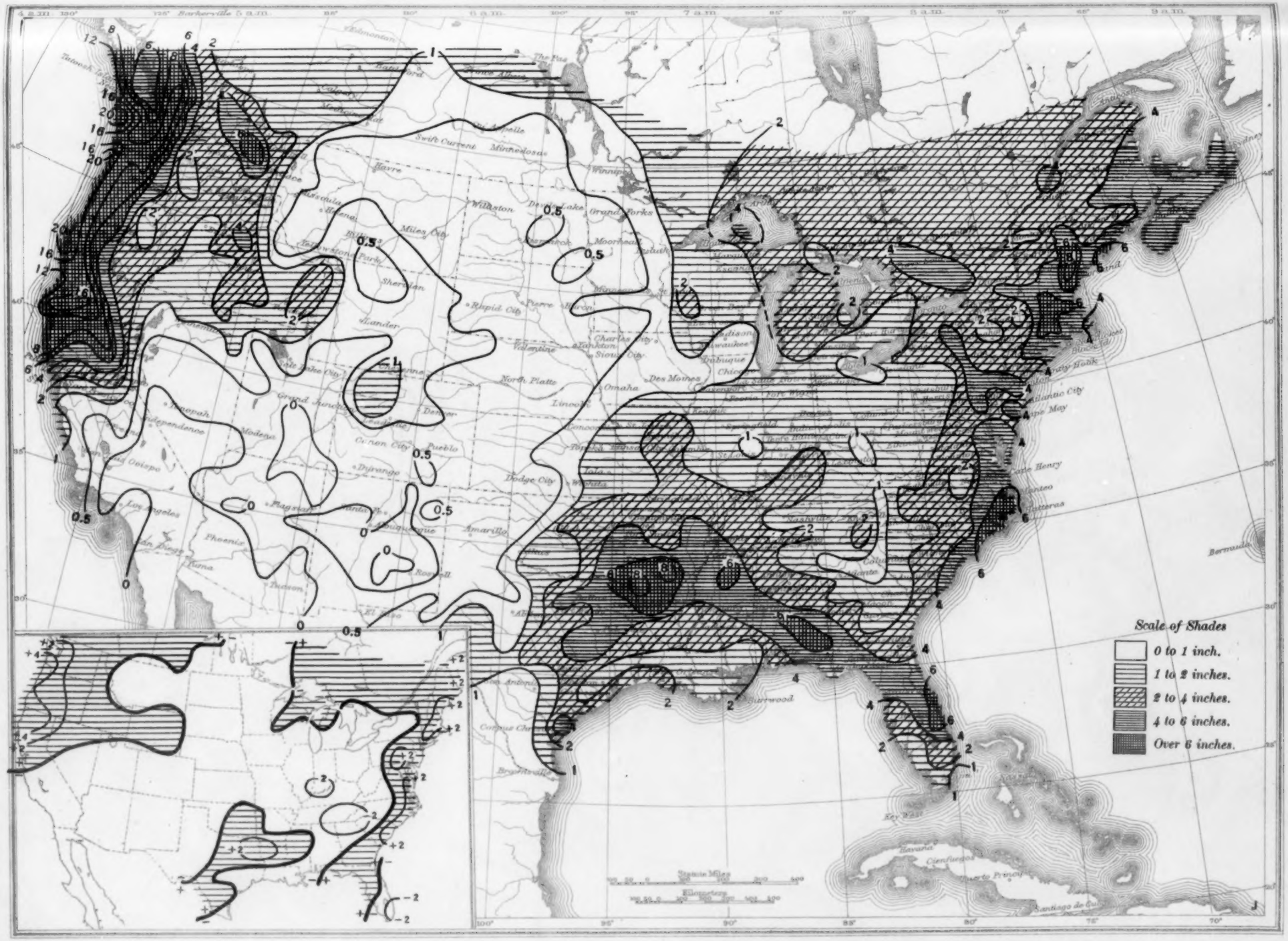

Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, November 1937

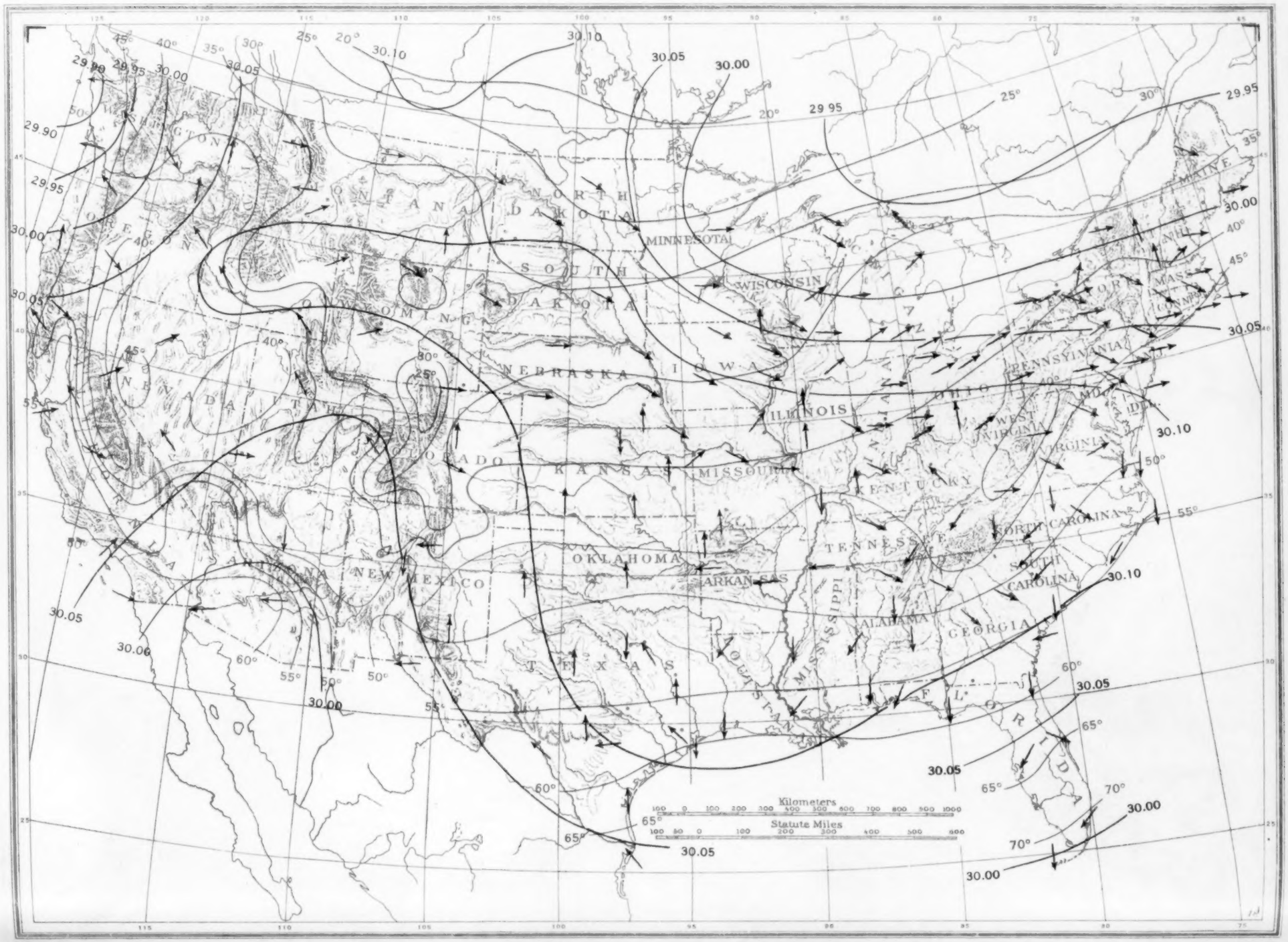

Chart VII. Wind Roses for Selected Stations, November 1937

(Plotted by W. W. Reed)

Chart VII. Wind Roses for Selected Stations, November 1937

(Plotted by W. W. Reed)

Chart VIII. Total Snowfall, Inches, November 1937

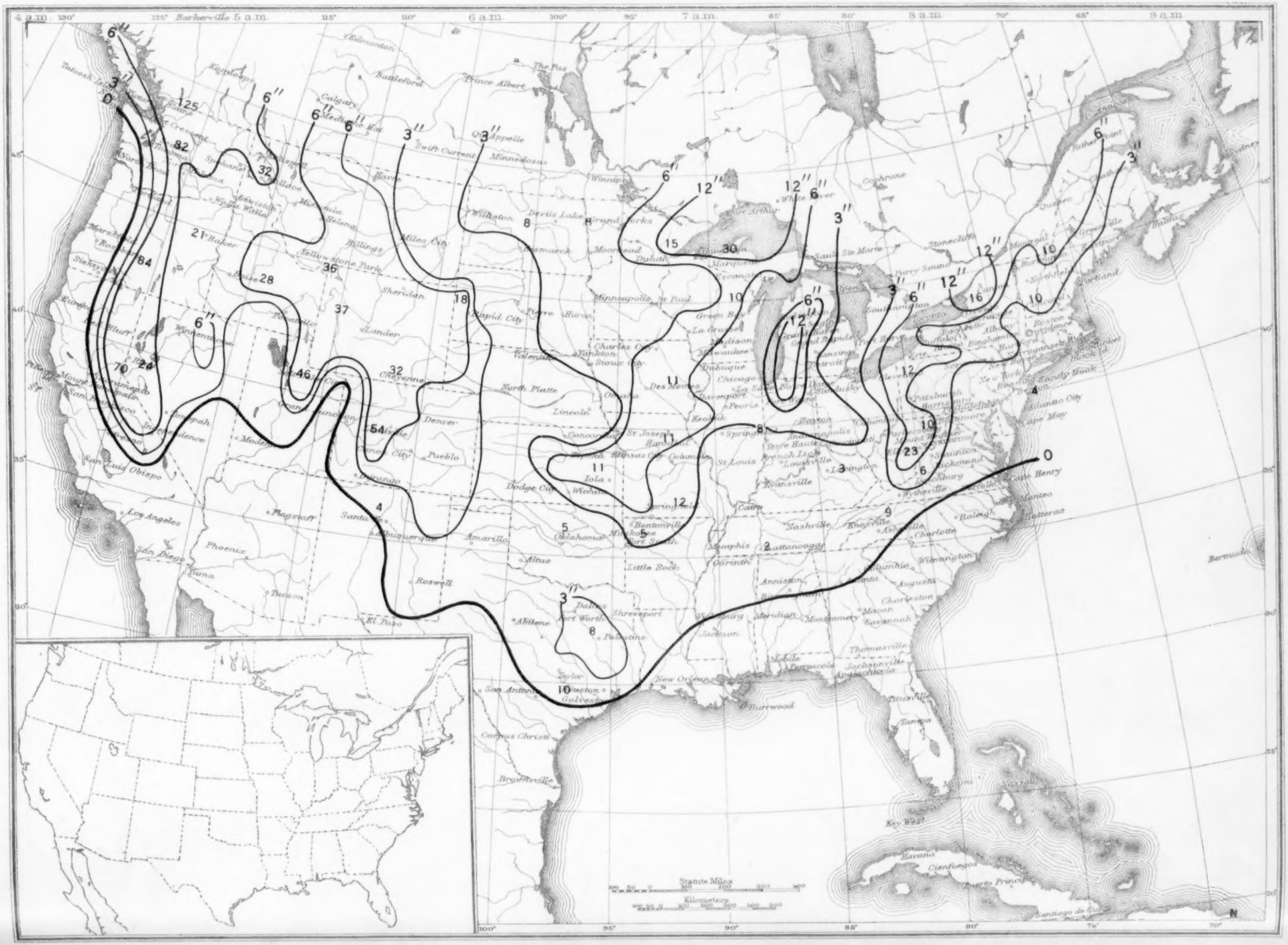

Chart IX. Weather Map of North Atlantic Ocean, November 25, 1937
(Plotted from the Weather Bureau Northern Hemisphere Chart)
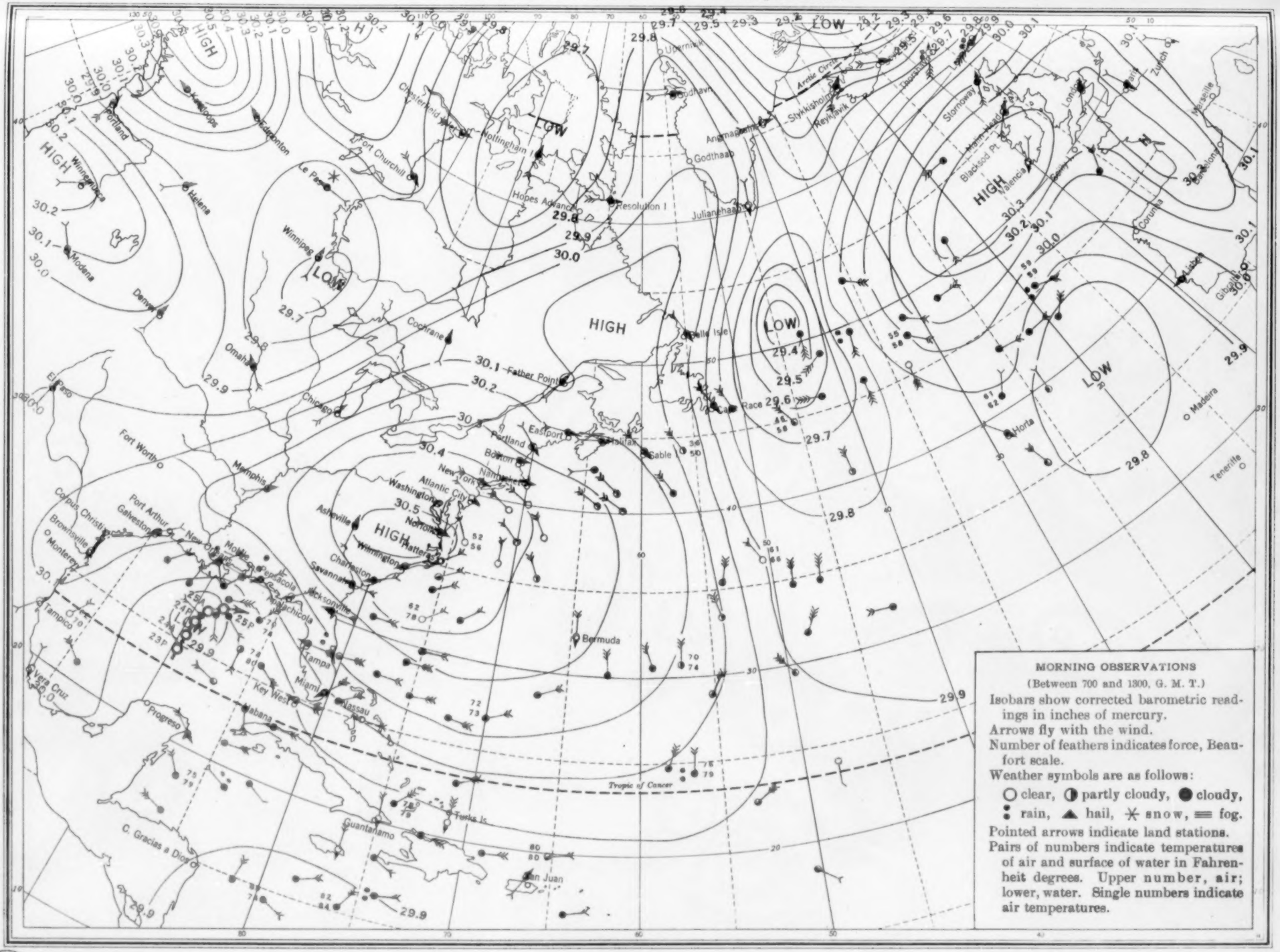
Chart IX. Weather Map of North Atlantic Ocean, November 25, 1937
(Plotted from the Weather Bureau Northern Hemisphere Chart)